TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 20.] 1923. [No. 7.

"HAEMOGREGARINES" IN MAN, WITH NOTES ON SOME OTHER SUPPOSED PARASITES.

By C. M. WENYON,

Wellcome Bureau of Scientific Research. Sectional Editor, Tropical Diseases Bureau.

Haemogregarines as parasites of cold-blooded vertebrates have long been known as objects of interest in blood films of these animals. That they occurred also in mammals was first demonstrated by the discovery by BENTLEY (1905) and JAMES (1905), in India, of a haemogregarine in the leucocytes of the dog, and by BALFOUR (1905), in the Sudan, and LAVERAN (1905), in Tunis, of a similar parasite in the red blood corpuscles of the jerboa. BALFOUR also noted a haemogregarine in the leucocytes of the rat, while CHRISTOPHERS (1905) in India described a form in the red blood corpuscles of the gerbil. Since that time many other mammals have been found infected with leucocytic or red blood corpuscle haemogregarines and observers have been on the look out for these parasites in human beings. During the last few years a number of species have been described from man. It seems, therefore, a suitable opportunity to examine the characters of the undoubted haemogregarines of animals and to compare them with those of the recently described human parasites.

For some time the only stages of haemogregarines which were recognized were the well known elliptical or looped forms which occurred in the blood cells, though the researches of LABBÉ and others had shown that reproducing forms—schizonts which gave rise to a number of merozoites—sometimes occurred in these cells in the peripheral blood. Such forms were more commonly found, however, in the internal organs, either in red blood corpuscles or other cells. It is now generally known that haemogregarines reproduce asexually by schizogony either in red blood cells, endothelial cells of the blood vessels, or other cells of the internal organs of the vertebrate. When this occurs in the red blood cells or endothelial cells these cells containing schizonts occasionally appear in the peripheral blood and are found in ordinary blood films but most usually, like blood corpuscles infected with schizonts of *Plasmodium falciparum*, they are held up in the vessels of the organs. The forms which occur most frequently in the circulating cells are those which are destined for development in some invertebrate host. The researches of REICHENOW (1910, 1921) and NÖLLER (1913, 1920) have shown that these haemogregarines which appear in blood films may be either gametocytes or sporozoites.

(10380) Wt.P.4/152 1,500 7/23 Harrow G.75 2P

In the case of certain forms (*Lankesterella, Schellackia*) the whole cycle takes place in the vertebrate and resembles that of a typical coccidium of the genus *Eimeria*. Sporozoites are finally produced and it is these which enter the red blood corpuscles. Without any further development they are handed on passively, by leeches in the case of *Lankesterella* of the frog, and by mites in the case of *Schellackia* of lizards, to another vertebrate host. In the case of other haemogregarines it is only the asexual cycle (schizogony) which occurs in the vertebrate, as in the case of malarial parasites, and when, finally, gametocytes are produced, these enter the circulating cells—in some cases red blood corpuscles, in others leucocytes. These gametocytes are then ingested by blood-sucking invertebrates and according to the course of the development of the oöcysts in these hosts the genera *Haemogregarina*, *Karyolysus* and *Hepatozoon* can be recognized. To the genus *Haemogregarina* belong the parasites of the water tortoises which are carried by leeches, to the genus *Karyolysus* certain parasites of lizards which are transmitted by mites, and to the genus *Hepatozoon* the parasites of the red blood corpuscles or leucocytes of mammals which are conveyed by ticks, mites, fleas or lice. In the case of the vast majority of haemogregarines, the only forms known are those which have been found in simple blood films, and in most instances these are gametocytes. The forms which appear in the peripheral blood of mammals (dogs, cats, jerboa, etc.) are always gametocytes. Schizonts occur only in the internal organs of these animals and have never been found in the blood stream.

As they occur in ordinary dried blood films—and it is these stages with which we are at present primarily concerned—the haemogregarines are of very uniform appearance though they differ considerably in size. There may be recognized three main types, all of which occur either in red blood corpuscles or leucocytes, enclosed in a membrane of varying thickness (Fig. 1).

1. *Long-looped forms.* These haemogregarines, of which the form in the tortoise is a good example, are elongate vermicules which are doubled within the enclosing membrane in the form of a U (Fig. 1 *e*). The two limbs, which are of equal length, are closely applied to one another and one of them is thicker than the other and has a blunt rounded end. The narrower limb tapers uniformly towards its extremity, which is also rounded. In the thicker limb occurs the nucleus, which is a dense mass of red-staining material occupying the whole width of the limb and is often longer than it is broad.

2. *Short-looped forms.* These forms are similar to those of Type 1, except that the narrow limb is short (Fig. 1 *f*). It may be half the length of the large limb or even smaller, and is often difficult to detect. The nucleus in the large limb is like that in Type 1.

3. *Forms without a loop.* These are sausage-shaped bodies which completely fill the membrane, and have no indication of a limb (Fig. 1 *a–d* and *g*). The nucleus is centrally placed and is a deeply-staining massive structure like that of the other types.

Though these three types can be recognized for purposes of description they are not sharply marked off from one another. Those of Type 3 are derived from the other types by gradual fusion of the two limbs or by a withdrawal of the smaller limb. It thus happens that all three may be seen in a single blood film. The nucleus is in all cases of much the same type. In dried films stained by Romanowsky stains it is a massive structure with a deep purple tint like that of

the nuclei of leucocytes or nucleated red blood corpuscles and is quite unlike the nucleus of a malarial parasite or halteridium, which is smaller and more delicate and stains a bright red colour. The membrane enclosing the haemogregarines as they lie in the cytoplasm of the cell is elliptical or sausage-shaped, has rounded ends and is perfectly smooth and devoid of any knobs or protuberances. Furthermore, in blood films which have been made directly from the blood of a living animal all the haemogregarines are within the cells.

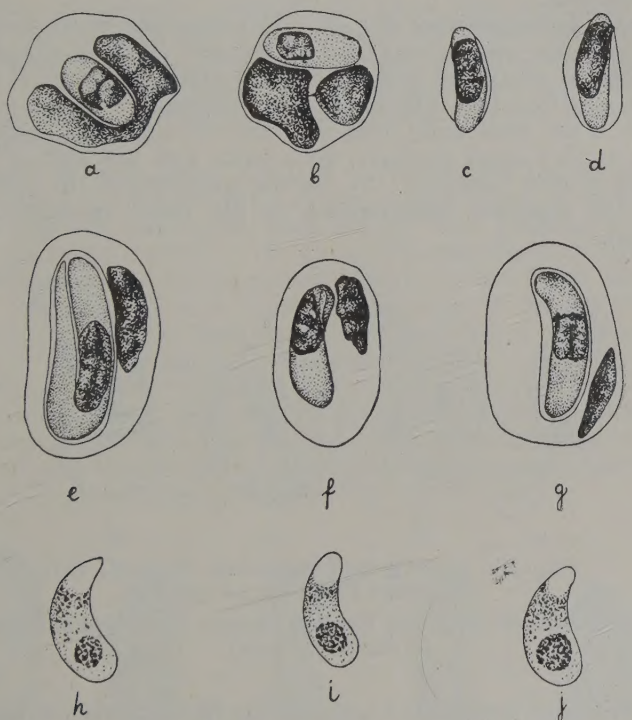


FIG. 1. Typical haemogregarines and spores of *Sarcocystis* as seen in dried films stained by Leishman stain. × 1000. *a* and *b*, haemogregarines in the leucocytes of the rat; *c* and *d*, haemogregarines in the red blood corpuscles of the jerboa; *e–g*, three types of haemogregarine in the red blood corpuscles of a cold-blooded animal; *h–j*, spores of *Sarcocystis*.

If, however, the animal has been dead some time, or if the blood is kept moist outside the body before the films are made, many of the haemogregarines will be found to have left the cells. This migration from the cell is undoubtedly the first stage in the further developmnet which occurs normally in the invertebrate host. Though the host cell may be enlarged and its nucleus displaced or otherwise altered in appearance the cell maintains its normal shape and regular contour. It has also to be remembered that haemogregarines do not come and go from the peripheral blood. Being forms which develop in an invertebrate they persist in the blood for long periods, like the crescents of *Plasmodium falciparum*.

It is important to bear all these points in mind when any structures which have a resemblance to haemogregarines are discovered in blood films or smears of organs. The uniform character of the enclosing membrane, the looping of certain forms within this membrane, the massive nature of the nucleus, and its colour reaction, and the intracellular situation in blood films made from living animals are the most important of these. With these facts before us, it will be possible to consider the various claims that have been made as to the occurrence of haemogregarines in man. These will now be examined chronologically.

Krempf's haemogregarine (Fig. 2). This organism, which was named *Haemogregarina hominis*, was seen by KREMPF (1917) in smears made from material which had been obtained by spleen puncture of a young Chinaman in Tien-Tsin suffering from splenomegaly. It was seen only in a few of the films made from this material, and even in these was present in very small numbers, for a lucky film was said to contain only one or two parasites. No further puncture of the spleen was made, but repeated examinations of the blood revealed nothing abnormal.

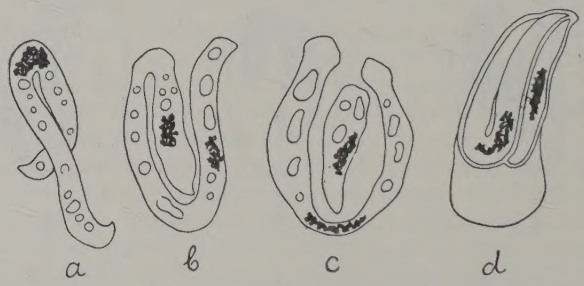


FIG. 2. *Haemogregarina hominis* Krempf, 1917. (Compare Fig. 9 F.2, I.3 and I.4.)

[Reproduced from the *Comptes Rendus de l'Academie des Sciences*, Paris.]

The organism is described as occurring in very much enlarged red blood corpuscles enclosed in a capsule or else free. The latter condition is attributed to rupture of the cell and liberation of the parasite as a result of smearing the material. The haemogregarine is said to be a long, narrow vermicule bent upon itself once or even twice. Those with three limbs divide transversely to form a large double-limbed form and a small form (Fig. 2 *c*). The long forms measure 20 by 1·5 μ. There is a single nucleus in the double forms and two nuclei in the triple forms. The nuclei stain a deep red colour while the blue-staining cytoplasm contains usually a number of round or oval bodies which have a bright red tint. Four diagrams are given, three of which depict free forms (Fig. 2 *a–c*) and one a form supposed to be in a red blood corpuscle (Fig. 2 *d*). No information is available as to the number of films made, but it seems evident that only a very small number of parasites was seen.

Whatever be the nature of the structures described they are certainly unlike any known haemogregarine. They are too long in proportion to their breadth and too irregular in outline. The fact that transverse binary division takes place suggests that they are not even Protozoa at all. The occurrence in the cytoplasm of the numerous homogeneous

bright red bodies, together with the method of division, is strongly in favour of a vegetable organism. The looped form within what is supposed to be a red blood corpuscle may be a phagocyted individual in a large mononuclear cell, the cytoplasmic portion of which has broken off, a not infrequent occurrence in film making, or it may be superimposed upon a cell. Somewhat similar organisms (Fig. 9 I. 3, 4), which were seen in smears of the spleen of a case of kala azar in the Sudan, were figured by BOUSFIELD (1911). These are undoubtedly vegetable cells. A similar structure (Fig. 9 F. 2) which occurred in what were undoubtedly contaminated blood films was depicted by ELDERS (1911). This also is probably a vegetable cell and it seems highly probable that KREMPF's *Haemogregarina hominis* is also of this nature. If it were a haemogregarine it would have appeared in the peripheral blood, and there is no evidence that it is a Protozoon, much less a haemogregarine.

Dimond's haemogregarine (Fig. 9 D). This supposed haemogregarine was described by DIMOND (1917) as the causative agent of trench fever. His findings and conclusions have already been questioned by LOW (1917) and DOBELL (1917). The films purporting to show this Protozoon were examined by competent observers, who found they were grossly contaminated with vegetable organisms of various kinds, so that there was not the least doubt that the cycle of development of DIMOND's "haemogregarine" was deduced from a mixture of contaminating vegetable organisms and altered leucocytes. The figures he gives are, however, instructive in showing how such vegetable cells which contaminate films may bear a superficial resemblance to haemogregarines, not only in their shape but in the appearance that may be produced of an intracellular habitat (Fig. 9 D. 1).

FIG. 3. *Haemogregarina inexpectata* Roubaud, 1919. × 2000 about. (Compare Fig. 4 *j–n* and Fig. 9 G.)

[Reproduced from the *Bulletin de la Société de Pathologie Exotique*.]

Roubaud's haemogregarine (Fig. 3). This organism was discovered by ROUBAUD (1919) in a single blood film made from a woman who had spent the period 1912 to 1914 in the Belgian Congo and had then lived in Europe. Seven days before the film was made in which the "haemogregarine" was discovered two other blood films had been examined without any detection of parasites. There was, however,

a mononuclear increase which suggested a malarial infection. The day after the discovery of the organism four other films were made, but in none of these was any organism found. It thus appears that the "haemogregarine" was present in the blood on one day and had entirely disappeared by the next. This fact alone raises considerable doubt as to the correctness of ROUBAUD's interpretation of the organism.

As regards the structure of the "haemogregarine" several types are described.

1. Large forms, 9 to 11 μ in length by 2·8 to 3·5 μ in breadth (Fig. 3, 1–4). These measurements do not include the enclosing membranes, which are interpreted as remains of red blood corpuscles. The organism is looped and would thus correspond to the second or short-looped type of haemogregarine described above. The short limb is small and narrow and has a length of about 3 μ. It is swollen and bulbous towards its extremity. The cytoplasm stains a deep blue colour. The nucleus is small and about 1·5 μ in diameter. Occasionally there are two nuclei, and sometimes two organisms are present within one membrane. The enclosing membrane may show a kind of knob which takes the eosin of the stain (Fig. 3, 2 and 5).

2. Smaller young forms free in the plasma and regarded as metabolic owing to the variety of shapes they assume—oval, piriform, reniform (Fig. 3, 7–9). These are often binucleate. They are interpreted as merozoites and have a length of 5·2–5·8 μ and a breadth of 1·7–2·3 μ. These forms are said to be capable of invading the red cells, and one which is figured with its pointed extremity on the edge of a red cell is regarded as evidence of commencing penetration of the cell.

3. A schizont which might be expected to occur in the blood owing to the presence of the merozoites is depicted (Fig. 3, 10). It shows what is supposed to be a segmentation into merozoites.

Discussing the nature of these various bodies ROUBAUD remarks that the organism is undoubtedly a haemogregarine of special type and different from the well known haemogregarines of mammals. He regards it as distinct from the form described by KREMPF and gives it the name *Haemogregarina inexpectata*. LEBOEUF (1921), without giving any details, states that he found a single element in a spleen smear made from a case of splenomegaly in the Congo. He states that it appeared to resemble the structures described by ROUBAUD.

Quite apart from the fact that ROUBAUD's organism was absent from the blood on the day following that of its discovery, there are many points about it which give rise to grave doubts as to its haemogregarine nature. The presence of two nuclei is a very unusual feature in true haemogregarines, though it sometimes does occur, as in dividing forms of *Haemogregarina bigemina* of fish and occasionally in other forms. The characters of the nucleus, which is only 1·5 μ in diameter, are quite unlike those of any known haemogregarine. Furthermore, the presence of the knob on the enclosing membrane in some forms is strongly suggestive of something other than a red blood corpuscle, for red cells parasitized by haemogregarines have never before been described as developing this peculiarity. It is probable that the membrane actually belongs to the organism, for a similar knob is also figured on some of the forms called merozoites, which

are not regarded as being intracorpuscular (Fig. 3, 7 and 9). The supposed penetration of the red cell at Fig. 3, 8, can equally well be interpreted as an accident in film making. As regards the schizont at Fig. 3, 10, this may be merely a modification of the form shown at Fig. 3, 5. It is not impossible that the contents divide into two and that a further division then occurs. The varying shape of the supposed merozoites resembles nothing which occurs amongst haemogregarines, the merozoites of which are not metabolic but uniformly gregariniform in character. Furthermore, the presence of a number of merozoites free in the plasma is not a feature of true haemogregarines. The bodies bear a resemblance to haemogregarines only in the presence of the loop, but this again differs from the turned-up limb of true haemogregarines in that its extremity is swollen and bulbous instead of being uniformly tapering. In view of the other discordant characters this loop alone is insufficient ground for characterizing the bodies as haemogregarines.

As in the case of KREMPF's organism, the writer is strongly of the opinion that ROUBAUD's is of vegetable nature. It is far from clear that it was actually in the blood, since in the most careful hands it happens from time to time that in some unexplained manner blood films become contaminated from without. There are many records of this in the literature, and some of these will be referred to below. Quite recently the writer had under observation certain ovoid bodies in faeces which were undoubtedly vegetable in nature (Fig. 4, *h* and *i*). When kept under observation for several days the contents were seen to divide into two elongate bodies. It is a well known fact that a division of the contents of certain vegetable cells into two, four or more daughter individuals occurs. *Chlamydomonas* (Fig. 4, *e–g*), for instance, is typically a biflagellated organism, but when division commences the flagella are lost; the cell wall or capsule is ovoid in shape, and has a small knob at one end; the contents divide into two elongate bodies, and each of these again to produce four; the daughter individuals are piriform in shape and in the possession of a knob at one end bear a striking resemblance to some of the forms depicted by ROUBAUD. Another form, *Polytoma uvella* (Fig. 4, *a–d*), which the writer has studied, divides in a similar manner. It is not impossible that such organisms might contaminate slides or even water which is employed for staining purposes. On several occasions the writer has been shown blood films containing problematic bodies which have been proved to have originated in the distilled water employed in the staining of the films. It seems not improbable that ROUBAUD's *Haemogregarina inexpectata* is a vegetable organism similar to those just referred to, that the turned-up limb may be the first stage in the process of division of the contents into two, and that the enclosing membrane is not the remains of a red blood corpuscle but the wall of the vegetable cell. If a dry film of *Polytoma uvella* is made and stained with Romanowsky stain, many of the organisms bear a striking resemblance to certain forms of ROUBAUD's "haemogregarine" (Fig. 4, *j–n*). Similarly, undoubted vegetable organisms which occur post-mortem in tissues appear in smears stained with Romanowsky stain with blue cytoplasm and red nuclei. The shrunken cytoplasm within the cell membrane may produce the impression of a parasite in the remains of a red blood corpuscle. A series of vegetable cells in a heavily contaminated spleen of a cat are shown at Fig. 4, *o–u*. In view of the points which have been raised, and the fact that the bodies were absent from the films

made on the day following their discovery, it seems impossible, without more convincing evidence, to regard *Haemogregarina inexpectata* as a haemogregarine.

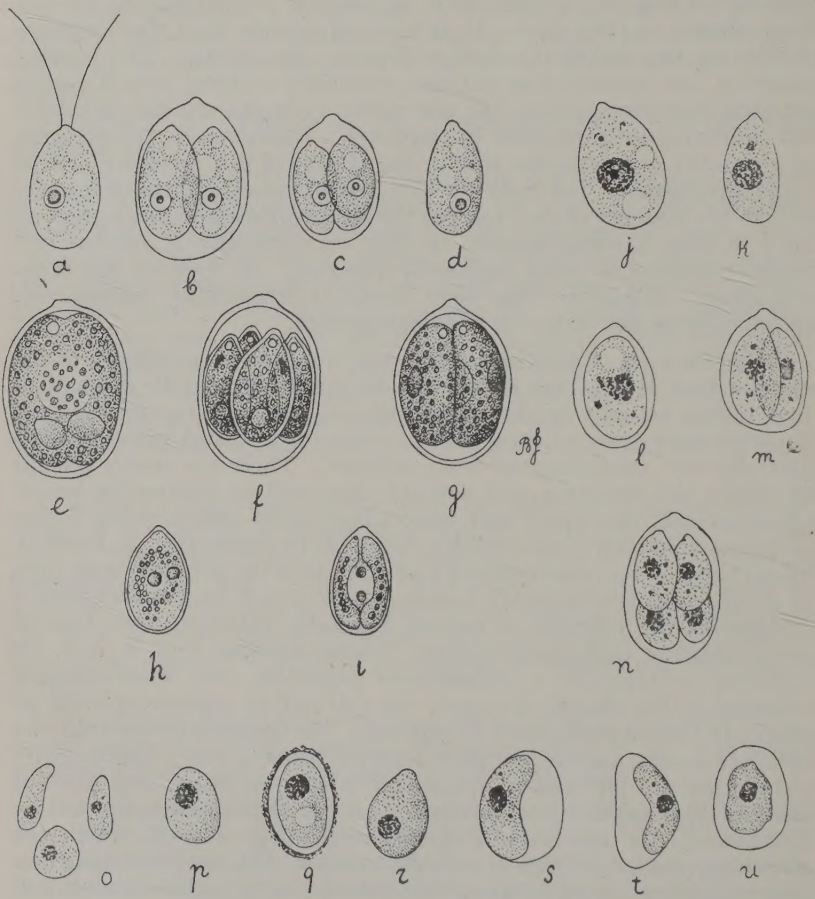


FIG. 4. Various vegetable cells which may contaminate films (× 1000): *a–d, Polytoma uvella* fixed in Schaudinn's fluid and stained with iron haematoxylin; *e–g, Chlamydomones angulosa* Dill, after Dill from Oetmann's treatise on the Algae; *h–i*, vegetable cells from human faeces, two stages in the development of one organism as seen in the living condition; *j–n, Polytoma uvella* in dried films stained by Leishman stain, the resemblances of these to some of Roubaud's "haemogregarines" is evident (compare Fig. 3); *o–u*, various vegetable organisms from heavily contaminated spleen of a dead cat; dry film stained by Leishman stain; the cytoplasm is blue and the nuclei red; the retracted cytoplasm within the membrane may produce the impression of a sausage-shaped body in an altered red blood corpuscle.

Sergent (Ed. & Et.) and Parrot's haemogregarine (Fig. 5). These authors (1922) commence their description by stating that in Corsica they have found in a girl a blood parasite intra- and extra-globular which appears to be new. The child was three years of age and was apparently in good health, although living in a highly malarious district. The films, which were apparently made during the course of a malaria survey,

consisted of two slides, one of which was spread as an ordinary thin film and the other as a thick film on which three drops were allowed to dry. No other examinations were made. In all, 128 forms of the parasite, which resembled a somewhat atypical haemogregarine, were found in these two slides. In the thin film sixteen parasites were seen, two of which are described as being intracellular. In the thick dehaemoglobinized film it was not possible, of course, to determine whether any were within the red cells. Nevertheless, in these thick films the parasites were still enclosed in a capsule, a fact which leads the authors to interpret the membrane as a capsule distinct from the red cell.

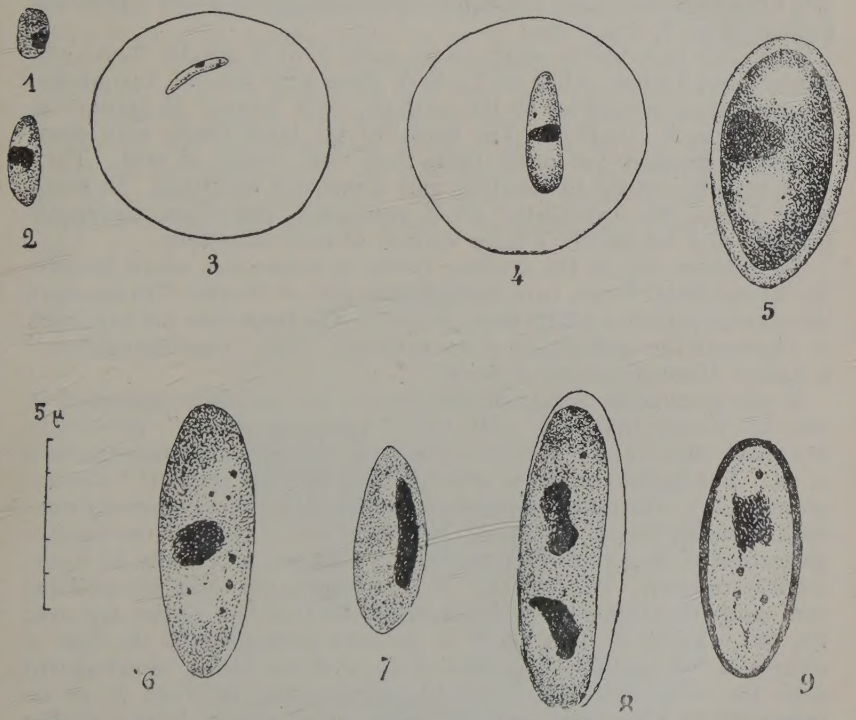


FIG. 5. *Haemogregarina elliptica* Sergent (Ed. & Et.) and Parrot, 1922. [Reproduced from the *Bulletin de la Société de Pathologie Exotique*.]

The description of the various forms seen is as follows :—

1. *Intracorpuscular forms.* These, of which only two were seen in the thin film, measured 2 by 0·4 and 3·5 by 1·0 μ (Fig. 5, 3, 4). They had the form of slightly curved rods with rounded ends, and consisted of homogeneous cytoplasm free from vacuoles but showing here and there somewhat clearer areas. The nucleus was central in position and slightly to one side. In each parasite besides the nucleus there occurred a large chromatic granule. The infected red cells were not altered in appearance in any way.

2. *Extracorpuscular forms.* These were very uniform in appearance and had the form of an ellipse with rounded ends. No vermicular stages were seen and no indication of a loop could be detected. The smallest form seen measured 1·4 by 1·0 μ (Fig. 5, 1), the largest 10·7 by 2·9 μ (Fig. 5, 8). The most frequent measurement obtained was 5–6 μ by 1·2–2·8 μ. In 49 forms, the length of which did not exceed 5 μ,

the cytoplasm was homogeneous and contained a compact nucleus and rarely a chromatic granule also (Fig. 5, 3 and 4). In the larger forms over 5 μ in length, of which 79 are mentioned, there were present capsule, cyst and nucleus which was drawn out or fragmented. Of these forms there were the following varieties :—

(*a*) In 8 individuals there was a capsule which was regularly elliptical in shape and which took a greyish-green colour with the Romanowsky stain. It appeared to be distinct from the remains of a red cell, for it was present in the well dehaemoglobinized films in which the red cells were destroyed (Fig. 5, 6 and 8).

(*b*) In 7 individuals the cyst was thick and stained a rose colour. The cytoplasm contained numerous chromatic granules and a granular nucleus (Fig. 5, 5 and 9).

(*c*) In 12 individuals which were over 5 μ in length there was a drawn-out nucleus, while in 7 others there were pre ent two nuclei, an indication, according to the authors, of a process of transverse division (Fig. 5, 7 and 8). The nuclei of the large forms were often polygonal in shape ; at other times they were round or oval. They were usually central in position and somewhat marginal. In these large forms the cytoplasm often contained numerous chromatic granules and frequently a large vacuole at each extremity.

The authors regard the smallest forms as merozoites which become the intraglobular forms, two of which were seen in the thin film amongst the sixteen parasites which were present. The large ones are supposed to represent the first stages of encystment. The "haemogregarine" is named *Haemogregarina elliptica.*

If the statements regarding the bodies are critically examined it will be found that, as with the "haemogregarines" previously described, there is no reliable evidence that they were haemogregarines at all. The authors admit at any rate that they are atypical "haemogregarines." The first unusual feature is the large proportion of extracellular forms, 14 out of 16 in the thin film. In the case of true haemogregarines in films made directly from the animal practically all forms are intracellular. The fact that only two appeared to be intracellular can easily be explained on the supposition that the bodies lay over the red cells as the film dried, a common occurrence in the case of objects in the plasma. The general shape of the bodies would accord with the view that they were haemogregarines of Type 3, as no indication of a loop was seen, but many other objects have a similar shape and this alone cannot be regarded as evidence of their haemogregarine nature. The nuclei, which in many forms were marginal in position, are again unlike the nuclei of haemogregarines, and the presence of two such nuclei in an organism indicating, as the authors state, a process of transverse fission is a feature of exceedingly rare occurrence in these parasites. If the statement as to the occurrence of transverse division is intended to apply to the haemogregarine and not to the nucleus alone, this again is contrary to what occurs in these parasites. The thick red capsule which was sometimes seen, as also the occurrence in some of the forms of a fragmenting nucleus and numerous red-staining granules in the cytoplasm, are not features of true haemogregarines. The presence of the two terminal vacuoles, which is specially mentioned, is not a feature of these parasites. The writer cannot avoid the impression that the bodies correspond more closely with vegetable cells than with haemogregarines (see Fig. 10).

It is unfortunate that the blood of the child was examined on only one occasion, and from the description it seems probable that the two

blood films were obtained from a single puncture of the skin, one thin film and one thick film being made. If the skin were contaminated with yeast-like organisms these would naturally appear in the films, and the occurrence of what are evidently extraneous bodies in films made during a malaria survey is familiar to the writer and must be also to others who have undertaken this kind of work. Such bodies again can find their way on to a film during the staining process if the water is in any way contaminated. In view of the fact that the authors were unable to make any further examination of the case it is impossible to exclude a skin contamination with absolute certainty. Even if it is admitted that the bodies were actually in the blood they are unlike haemogregarines in so many important respects that it is quite illogical to assume them to be of this nature. On the other hand their resemblance to vegetable organisms is so close that if any conclusion at all be legitimate it is that they are such, and probably of extraneous origin. The character of the capsule, the structure of the nuclei and the occasional presence of two in one organism, the numerous red granules in the cytoplasm and the terminal vacuoles are all in favour of this view. The writer is forced to the conclusion that *Haemogregarina elliptica* is not a haemogregarine but a vegetable cell.

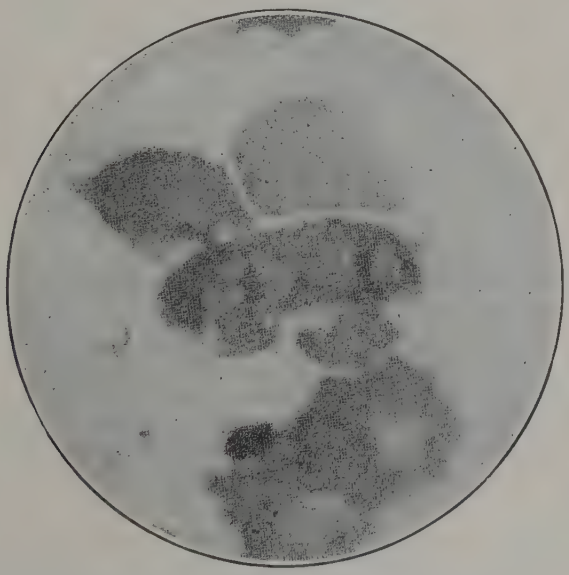


Fig. 6. *Haemogregarina gallica* Noc, 1922.
[Reproduced from the *Bulletin de la Société de Pathologie Exotique*.]

Noc's haemogregarine (Fig. 6). The parasite described was discovered by Noc (1922) in the blood of a patient 59 years of age who had always lived in the neighbourhood of Paris. He had suffered for several months from a continued fever of doubtful nature. In a film made from blood taken from the elbow vein was found a sausage-shaped body measuring 14 by 4·5 μ. One end was mucronate, while the other terminated in a turned-up tail 5·4 μ in length. The tail, unfortunately, cannot be detected in the microphotograph illustrating the paper. The whole was enclosed by a simple membrane.

The organism lay, as the figure shows, against a broken red cell, but it was not possible to assert that it was actually within the cell. It possessed two vacuolated nuclei, one of which was near the centre, while the other was near one end. The median nucleus contained three chromatin granules of fairly large size, while the other was a red mass more ill defined. The body contained no pigment, but some dark granules were present in the membrane near the pointed end.

A second blood examination made on the following day showed in one film a vermicular form of the parasite measuring 15 by 4 μ, with an oval chromatic granule. There was a small "gregariniform" prolongation anteriorly, while the posterior end was narrow but not looped. The patient was in such a grave condition that it was not possible to undertake a systematic examination of the blood. However, a few drops of blood were obtained with difficulty, so that in all six thin films and four thick ones were secured. In addition to the forms described above, a group consisting of two merozoites, 5–6 μ in length by 1·5 μ in breadth, accompanied by a small spherical mass 1·5 μ in diameter, was seen. The small spherical body was regarded as being possibly a third merozoite. No other organisms were seen in the films. The patient died shortly after, but it was not possible to perform an autopsy. The author discusses the relation of his organism, which he assumes to be a haemogregarine, to those previously described, and considers that it resembles Roubaud's *Haemogregarina inexpectata* in some respects, but differs in its larger size, the greater thickness of the enclosing membrane, the presence of the three bright red ovoid chromatin masses in one of the nuclei, the larger size of the merozoites, and the presence of external pigment round the end of the capsule. On this account the author proposes to call his parasite *Haemogregarina gallica*. In a discussion following the presentation of the paper, Roubaud remarks that in his opinion there is insufficient evidence to justify the creation of a new species. He thinks that Noc's parasite is probably identical with the one he called *Haemogregarina inexpectata*.

Noc's description is accompanied only by a microphotograph of the large sausage-shaped body (Fig. 6). This shows very little detail, but it depicts a body bearing some resemblance to the large forms of Roubaud's organism. The mucronate extremity is suggestive of a vegetable cell like *Polytoma*. All that is mentioned about the merozoites is that they were slightly curved. It seems impossible to speculate as to the nature of these bodies. If they were actually haemogregarines it is curious that the only forms seen should have been so atypical. The presence of two nuclei and the structure of these would suggest that the organism is not a haemogregarine. Here again it is not impossible that the bodies were of extraneous origin. If the supposed parasite had been a haemogregarine surely the examination of the films would have revealed something more characteristic, and if, as the author seems to assume, the grave condition of the patient was due to this infection the blood should have contained a larger number of organisms. The discovery in blood films of a few problematic structures like those described is quite insufficient to justify the assertion that they were actually haemogregarines.

Nattan-Larrier's haemogregarine. The publication of the above-recorded observations on human "haemogregarines" led the author (1922) to give an account of certain bodies he had found in the

blood of a patient, in 1906, who had been in the Belgian Congo. Only one film was examined, and in this two trypanosomes (*T. gambiense*) were found in addition to the bodies described as haemogregarines. The latter were fairly numerous, the preparation showing four to every hundred leucocytes. In the present paper, which the author says is a preliminary note, he describes what he regards as the more typical forms. They had the form of a lentil, with sharp and regular contours. The two poles were alike and were generally obtuse. The length varied from 6 to 7·5 μ and the breadth from 1·6 to 2·4 μ. In films stained with Leishman or Giemsa stain the cytoplasm was blue and contained a number of chromatin granules and possibly fine granules of a blackish pigment. The centrally placed nucleus usually lay against the convex border of the parasite. It was small and had a diameter which reached a third, or at most a half, of that of the organism itself. It was often surrounded by a clear area of cytoplasm. Some of the "haemogregarines" were surrounded by a fine refringent membrane. The author concludes that this "haemogregarine" approaches *Haemogregarina elliptica* of the SERGENTS and PARROT, but that it differs in certain details which will be communicated in a paper to be published later. It cannot be mistaken for *Haemogregarina hominis* of KREMPF, nor for *Haemogregarina inexpectata* of ROUBAUD. On this account a new species, *Haemogregarina equatoralis*, is created.

No figures accompany this description, but as none of the organisms is described as being intracellular it may safely be assumed that they were free in the plasma, in which case they would be quite unlike haemogregarines. Apart from this, however, there is no evidence whatever that they are of this nature. The small size of the laterally-placed nuclei, the lentil shape of the parasites, and their small size and the presence of the refringent capsule leave no doubt that the bodies described bear very little resemblance to any known haemogregarine. In this case, again, they were found in a single film, and it is impossible to assert that they were not of extraneous origin. Like the other "haemogregarines" described, they are most probably vegetable cells of yeast-like nature.

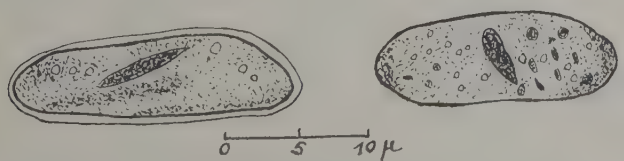


FIG. 7. *Haemogregarina cynomolgi* Langeron, 1920.
[Reproduced from the *Bulletin de la Société de Pathologie Exotique*.]

Langeron's haemogregarine (Fig. 7). LANGERON (1920), influenced by the descriptions which had appeared of the human "haemogregarines," was led to call attention to certain bodies which BLANCHARD and LANGERON (1912) had recorded from the blood of a monkey (*Macacus cynomolgus*) infected with the malarial parasite *Plasmodium kochi*. The bodies in question, only three of which were seen on a single occasion, were ovoid and measured 17–19 μ by 5·6 μ. The cytoplasm stained intensely blue, and contained numerous red-staining granules. Near the centre was a somewhat elongated area of red-staining material, the nucleus. Of the three bodies, one was surrounded by a pink-staining membrane, which is interpreted

as the membrane of a red blood corpuscle, while the others appeared to be devoid of membrane and are described as being free in the plasma. Subsequent examinations of the blood and organs of the monkey did not throw any light on the supposed parasite, which is said to have affinities as obscure as those of the human haemogregarines. Nevertheless the conclusion is reached that it is actually a haemogregarine and the name *Haemogregarina blanchardi* was given it. It appeared, however, that this name had previously been used for a haemogregarine of a fish, so LANGERON (1920 *a*) proposed to substitute the name *Haemogregarina cynomolgi*.

As with the other records, the presence of the supposed parasite in the blood on only one occasion is a very strong argument against its haemogregarine nature. The large size of the bodies and the character of the nuclei are not those of parasites of this kind, while the occurrence of vacuoles and other granules in the cytoplasm, together with the shape, is strongly suggestive of some vegetable cell. The supposed membrane of one of the bodies, which is thought to be that of a red blood corpuscle, can equally well be interpreted as the membrane of a vegetable cell. The writer has recently had an opportunity of discussing these bodies with M. LANGERON, who has very kindly permitted him to examine the slide. The film was made from the monkey's ear, which was in bad condition owing to repeated incisions for abstraction of blood. There are present in addition to the three bodies a number of yeasts and bacteria. M. LANGERON himself is far from being convinced that the structures he described as haemogregarines are actually of this nature. It seems to the writer that they are most probably large vegetable cells. The large "bacilli" which commonly occur in the intestine of rabbits, when dried and stained by Leishman stain, appear as large sausage-shaped bodies with red nuclei and show just as much resemblance to haemogregarines as do LANGERON's and NOC's organisms (Fig. 10). They frequently possess two terminal vacuoles and red-staining granules.

Leger and Bédier's haemogregarine. This organism was discovered post-mortem by LEGER and BÉDIER (1922) in films of the heart blood of a baboon (*Papio sphinx*) which had died in the Biological Institute in Senegal. The animal had an infection of *Plasmodium kochi*. The "haemogregarine" appeared to be free in the plasma and occurred in the form of elongate bodies with rounded ends measuring 16 by 5·5 μ. The blue vacuolated cytoplasm contained, in addition to the nucleus, a number of chromatoid granules. The nucleus is described as a caryosome which lay obliquely near the thicker end of the organism. In addition to these large bodies other smaller forms were seen, measuring 2·5 to 4 μ in length. The authors are doubtful if these are actually stages of development of the "haemogregarine." They point out that the absence of pigment excludes them from the cycle of the malarial parasite, but they do not consider the possibility of their being vegetable cells, a view which appears to the writer to be the most reasonable. LEGER and BÉDIER believe the "haemogregarine" to be allied to *Haemogregarina cynomolgi* of LANGERON, and they propose to name it *Haemogregarina cynomolgi* var. *papio*. There are no figures accompanying the description of the organism. In this case, as in so many of the preceding ones, the organism was only found on one occasion post-mortem, and the fact that the small bodies also occurred is strongly suggestive of the tissues of the baboon having become contaminated after death.

Mention may be made here of two other supposed haemogregarines which have been recorded from cattle. MARTOGLIO and CARPANO (1906) described as *Haemogregarina bovis* certain elongate, slightly curved bodies measuring 7–10 by 1·6–2 μ which they found free in the plasma in a wet blood film made from an ox and which had been kept moist overnight (Fig. 8, *a–c*). When the film was smeared and stained with Romanowsky stain the bodies were blue and showed a central elongate nucleus. One appeared to have a dividing nucleus and was bifurcated (Fig. 8, *b*). Further films made from the blood of the animal failed to reveal any of the supposed parasites, while an exhaustive examination of the blood and organs when the animal died some time later was likewise negative. There can be no doubt that the "haemogregarine" was a contaminating vegetable organism.

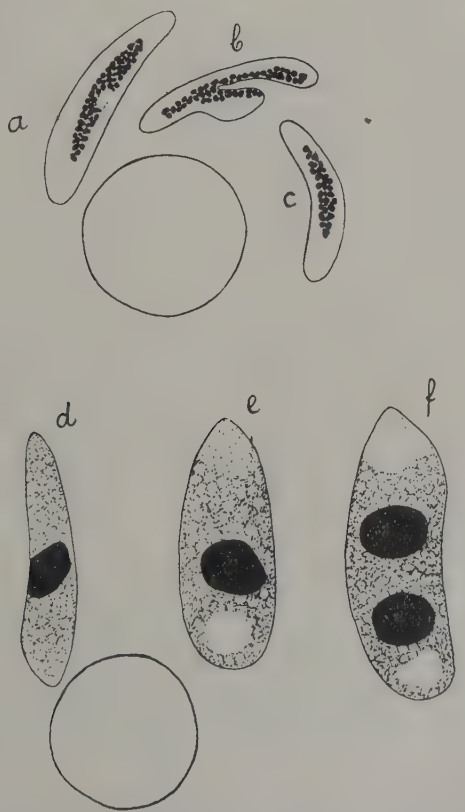


FIG. 8. *Haemogregarina bovis* Martoglio and Carpano, 1906 (*a–c*), and *Haemogregarina boum* Legras, 1918 (*d–f*).

The second "haemogregarine" of cattle is one which was discovered by LEGRAS (1918) in the blood and lymphatic glands of a heifer which had been inoculated nine days before with an emulsion obtained from the lungs of a cow affected with jaundice (Fig. 8, *d–f*). The bodies, which are called *Haemogregarina boum*, varied in length from 6·7 to 8·6 μ and in breadth from 1·5 to 2·5 μ. In all, ten of the bodies

were found, one only of which occurred in 31 blood films. The remaining nine were in smears of the lymphatic glands. Seven of the bodies had a single nucleus at the centre, while three had two nuclei. Most of them possessed one or two terminal vacuoles. It is pointed out that the latter condition is remarkable, since multiplication by transverse fission, which these forms appear to indicate, is unknown amongst true haemogregarines. Nevertheless, the conclusion is reached that one of these parasites is represented. The fact that only one form was seen in 31 blood films shows that the organism did not behave like a haemogregarine, and in view of their extracellular position, two nuclei and terminal vacuoles, there is little doubt that *Haemogregarina boum* is a vegetable organism.

In addition to the structures which have been described above and have been definitely claimed to be haemogregarines several observers have recorded similar bodies from man. Thus MANSON (1905) described certain structures which were found in smears of the spleen and liver made from a fatal case of kala azar (Fig. 9, G). It was thought that they possibly represented some hitherto unrecognized stage of the Leishman-Donovan body, but, on the other hand, it was realized that they might have resulted from accidental contamination of the slides. The writer saw these films and has no hesitation in stating that the structures were yeast-like organisms. The resemblance they bear to the supposed haemogregarines of man will be evident from the figure which is reproduced here.

Similarly, ELDERS (1911) described a very varied assemblage of organisms as occurring in the blood of obscure cases of fever in Sumatra (Fig. 9, F). It is quite evident that all of these result from contamination of the blood films, as, indeed, SCHÜFFNER (1911) pointed out. SCHÜFFNER remarked that some of the supposed organisms represent fungi or algae which are frequently found in preparations in Sumatra and come either from the air or water. An inspection of the coloured plate accompanying ELDERS' paper will convince any critical observer that SCHÜFFNER's view is correct, yet it will also be evident that some of the bodies figured by ELDERS bear a superficial resemblance to haemogregarines.

BOUSFIELD (1911), working in the Sudan, discovered and figured certain "unrecognized bodies in kala azar spleen films" (Fig. 9, I). It is supposed that these may be altered Leishman-Donovan bodies as a result of an injection of orsudan. They are undoubtedly vegetable organisms and some of them in the possession of a single large central mass and in their sausage-shape resemble haemogregarines. The larger forms, though not looped, appear to be similar to KREMPF's "haemogregarine."

BALFOUR (1911), in a paper on "Fallacies and Puzzles in Blood Examination," gives a coloured plate of a blood film made from a Uganda cob which had been shot (Fig. 9, E). This film contained numerous structures which were undoubtedly contaminations, probably as a result of wounding of the intestine and mixture of the escaping contents with the blood. Some of the bodies bear a striking resemblance to haemogregarines.

CASTELLANI and CHALMERS (1919, p. 538) record the discovery by SAMBON in a lemur of certain structures which they say may have some relation to the spores of *Sarcocystis*. The writer saw these films, which were made from the lemur post-mortem. He has no hesitation in stating

that they were sausage-shaped vegetable organisms, which nevertheless had some superficial resemblance to haemogregarines. They had probably invaded the tissues from the intestine after the death of the animal.

Castellani and Willey (1905) describe and figure certain elongate sausage-shaped structures, which they observed "in the finger-blood of a native fever patient" (Fig. 9, H). There is little doubt that these are vegetable cells which have contaminated the blood films. Similar organisms, evidently contaminations, are figured as occurring in the blood of birds. As regards those in the human blood, Castellani and Chalmers (1919, pp. 537–538) say that they may be the spores of *Sarcocystis*, but they are again quite unlike these bodies (Fig. 1, *h–j*).

It may be mentioned here that Sergent (1921) discovered numbers of undoubted spores of *Sarcocystis* in a blood film made from blood obtained from a puncture of the skin of an ox. These spores, as they appear in dried films stained with Romanowsky stain, are slightly curved sausage-shaped blue structures with a large central nucleus (Fig. 1, *h–j*). Both ends are rounded, but one is narrower than the other and the narrow end consists of clear homogeneous cytoplasm (the capsule), which contrasts with the more deeply staining granular cytoplasm of which the remainder of the spore is composed. None of the "haemogregarines" described from man or monkeys resembles the spores of *Sarcocystis*.

Another organism which can probably be explained on the assumption that it is a vegetable cell is *Toxoplasma pyrogenes* Castellani, 1914, which was discovered in smears of the spleen and blood of a case of splenomegaly in Ceylon. The description given in the original paper (1914) and that in Castellani and Chalmers, *Manual of Tropical Medicine* (Third Edition, 1919, pp. 489–490) are somewhat discordant. Two types of parasite are described. The commonest form has a roundish, oval or crescentic form with pale blue-staining cytoplasm and a large chromatin mass at one pole or at the centre (Fig. 9, B. 1–4). The second type is a larger spherical body 8–12 μ in diameter and containing several masses of chromatin (Fig. 9, B. 5). It is supposed that this is a schizont. In the original paper the small forms are said to be confined to the spleen, while the larger bodies, which are exceedingly rare, are said to occur in the blood as well as in the spleen. Examination of the coloured plate accompanying the original paper shows that the large form depicted from the blood is identical with the large form depicted from the spleen. And this identity is so close as regards the number, shape, size and arrangement of the chromatin granules that one is tempted to assume that both the drawings were made from the same object. This temptation becomes greater when it is found that in the description of the parasite in the *Manual of Tropical Medicine* it is stated that this type occurs only in the blood. Quite apart, however, from this discrepancy, there appears to be no evidence that the bodies are Protozoa at all. The large ones are undoubtedly degenerate leucocytes or fragments of a broken-down mononuclear cell with ruptured nucleus. The small ones are probably vegetable organisms like yeasts, which in smears frequently appear like the bodies drawn in the plate. Reporting on Castellani's preparations, Plate (1914) says that he is "absolutely convinced that the bodies are not degenerated red cells nor degenerated blood platelets nor degenerated tissues of any kind. The free bodies are especially characteristic, most of them being

FIG. 9. Various bodies, probably of vegetable nature, which have been described as parasitic protozoa. The magnification is indicated by the red blood corpuscles.

A. *Toxoplasma pyrogenes* reproduced from Plate (1914) from films made by Castellani.

B. *Toxoplasma pyrogenes* reproduced from Castellani (1914). 1–4, small forms; 5, large form described as schizont (compare Fig. 4, *o*, *p*, *r*).

C. *Toxoplasma pyrogenes* reproduced from Fedorovitch (1916). (Compare Fig. 4, *o*.)

D. Dimond's haemogregarine of trench fever.

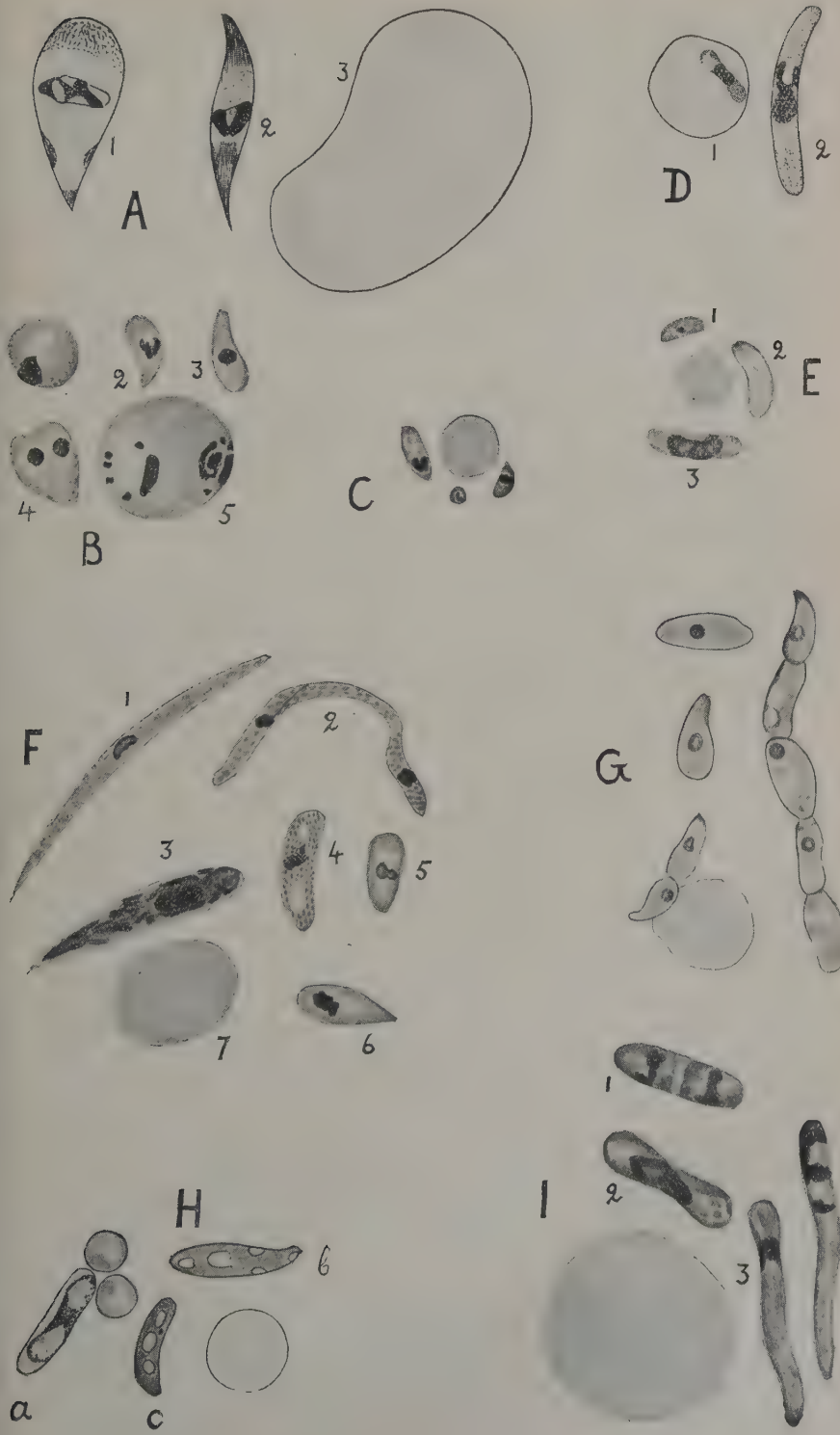
E. Vegetable cells depicted by Balfour (1914) from a contaminated blood film of a Sudan cob. The form E 3 bears a striking resemblance to a haemogregarine (compare Fig. 1, *c*, *d*).

F. Vegetable cells and other organisms described by Elders (1911) as parasites in human blood. The form at F 3 may be a *Euglena* or *Astasia* (compare Fig. 3, 8, Fig. 5, 4, Fig. 8, *d*).

G. Vegetable cells described by Manson (1905) from a spleen smear made post mortem from a case of kala azar.

H. Vegetable cells described by Castellani and Willey (1905) from human blood. Castellani and Chalmers (1919) make the suggestion that they may be spores of *Sarcocystis* (compare Fig. 1, *h–j*).

I, Vegetable cells seen in spleen smear of a case of kala azar by Bousfield (1911).


1
2
3
A
D
B
C
E
F
G
H
I
a
c
4
5
6
7

pear-shaped, crescentic or lanceolated; $2\frac{1}{2}$ to 6 μ in maximum diameter and possessing a well developed nucleus, either in the middle or at one pole, which may at times be vacuolated; none of the bodies contained any pigment. Occasionally these bodies are agglomerated together in large groups." He continues that in his opinion "the bodies described by CASTELLANI with the name *Toxoplasma pyrogenes* are, without doubt, of protozoal origin and differ from any other protozoal organism so far described in man; but no conclusion can as yet be come to as regards their being toxoplasmata or not; in fact no conclusion can be arrived at as regards their exact zoological classification." PLATE's account is accompanied by a drawing (Fig. 9, A) of two of these bodies which show far more details than the obviously schematic figures given by CASTELLANI. It does not appear to have occurred to PLATE that there was a possibility of such structures in spleen smears being vegetable cells, for having decided that it was impossible to determine their exact zoological classification he would, if he had been familiar with such sources of error, have considered this possibility before concluding that they were without doubt of protozoal origin. The figures he gives undoubtedly represent vegetable organisms.

It is stated by CASTELLANI and CHALMERS (1919) in a support of CASTELLANI's claim that FEDOROVITCH discovered similar bodies in the peripheral blood of a case of splenomegaly in a child and a dog on the Black Sea Coast. FEDOROVITCH (1916) states that he discovered these bodies, which were not intracorpuscular, in the peripheral blood taken from the ear of the child (Fig. 9, C). They measured 2–3 to 7 μ in length. Most of them were oval and elongated, and with one extremity pointed. Other forms were smaller and round. With Giemsa stain they appeared with blue cytoplasm and red nucleus. Some of the parasites took a lilac colour. The nucleus was either central or terminal in position. He says the parasite is closely related to that described by CASTELLANI. He hesitates to classify the organism, but states that in 1905 he found a similar parasite in the blood of a dog. The coloured figures given by FEDEROVITCH leave no doubt that the bodies were vegetable organisms like large cocci and yeasts. The elongate forms correspond exactly with those depicted at (Fig. 4, *o*). which were present in a heavily contaminated spleen of a cat. CHALMERS and KAMAR (1920) claimed to have found this parasite in the Sudan but, as pointed out by the writer (1922), the structures seen in this case were altered *Leishmania*. It is the writer's opinion that the organism called *Toxoplasma pyrogenes* is neither a Toxoplasma nor a protozoon, and that the name is a *nomen nudum*, as it is given to certain unidentifiable vegetable cells.

The spindle-shaped structures, 40 microns in length, recorded from human blood as Protozoa by Ed. & Et. SERGENT (1903) and named *Sergentella hominis* by BRUMPT (1910), are almost certainly of vegetable nature. They resemble the form at Fig. 9, F. 1 with which they may be identical.

In this connexion a paper published by ROCHA-LIMA (1912) is most instructive. In a clear description, which is accompanied by an excellent coloured plate, this author showed how *Cryptococcus farciminosus* and *Histoplasma capsulatum*, both of which are unquestionably vegetable organisms, were mistaken by numerous observers for Protozoa related to *Leishmania*. He pointed out that yeast-like bodies of this

description, when stained with Romanowsky stains after drying, often showed a blue cytoplasm containing a large red mass as well as a separate and distinct red granule. The presence of similar structures in some of the human "haemogregarines" has been noted above.

Alexeieff (1912) was so impressed by the resemblance of haemogregarines to certain stages of *Euglena* and *Astasia* which he found in the intestine of tadpoles and cyclops, that he considered it possible that haemogregarines had been evolved from these vegetable-like flagellates which had acquired parasitic properties.

To illustrate how "haemogregarines" may be produced, Fig. 10 has been made. The organisms depicted have blue cytoplasm and red nuclei. They actually represent the large "bacilli" which commonly occur in the faeces of rabbits. The films are prepared as follows. Some of the faeces is mixed with water and, when the sediment has formed, a drop of the water is spread as a thin film on a slide and allowed to dry. A blood film is then spread and the film is stained with Leishman stain. This simple experiment will convince anyone of the difficulty there would be of distinguishing such organisms from Protozoa if they occurred unexpectedly in blood films. It is hardly necessary to emphasize the resemblance they have to some of the "haemogregarines" described.

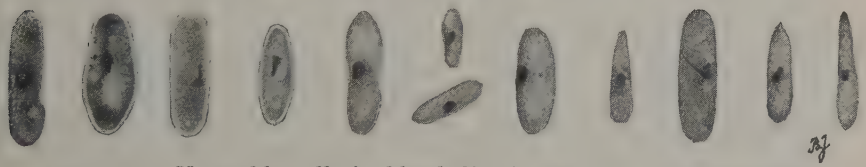


Fig. 10. Vegetable cells in blood film intentionally contaminated with organisms from the intestine of a rabbit. Note the appearance of a loop and the mucronate extremity.

From what has been said above it is clear that in the course of investigations observers have on many occasions been misled into describing as Protozoa structures which are undoubtedly vegetable organisms. It is the writer's opinion that the so-called haemogregarines of man are of this nature. In some cases the vegetable cells, as with *Cryptococcus farciminosus* and *Histoplasma capsulatum*, were actually parasitic in the tissues examined. In other cases they have been the result of invasion of the tissues, probably from the intestine after death, while in others they have resulted from outside contamination of the films. Such vegetable cells and yeasts when present in smears stained by the usual Romanowsky stains often appear remarkably like Protozoa (Fig. 4, *o–u*). The cytoplasm stains a varying depth of blue, while the nucleus appears as a mass of bright red granules. In some cases the wall of the vegetable cell is not apparent, while in others it is clearly visible. The cytoplasm within it may shrink in various ways. Sometimes it does so in such a manner as to leave a space between it and the cyst wall, while in others it becomes a sausage-shaped body lying against the side of the cyst. The resemblance of such forms to parasites within altered red blood corpuscles is evident. From the fact that in practically all instances the "haemogregarines" of man were found in only a single blood film or in a series of films made at one time, and that in several cases subsequent examinations of the blood revealed no organisms, the writer feels

that it is impossible to exclude the entry into the films of extraneous organisms. He is convinced that all the forms described are better explained on the assumption that they are vegetable cells of such an origin than that they are Protozoa. The most careful observers are bound to find vegetable organisms in blood films from time to time. This is easily explained in the case of blood films made, for instance, from a rat's tail, in which an extraordinary assemblage of yeasts and bacteria often occur.

In the case of human beings, such gross contamination of the skin is of rarer occurrence. Quite recently, however, the writer was asked to examine a blood film which had been made from the finger of a well-known man. There occurred groups of bodies which were thought to be possibly leishmania. It was apparent, however, that they were yeasts, and the presence in the films of various types of bacteria showed that there had been contamination from a dirty finger or slide. It is unfortunate that the various authors who have described the "haemogregarines" of man have made no statement as to the presence or absence in their films of contaminating organisms.

It is a fact which is well known to haematologists of any experience that extraneous organisms may be found in films as a result of contamination of the slide or of the skin, or deposits from the air. But it is not always realized that they may be present in the distilled water used in the staining process, which may quickly develop flagellates and other organisms, especially in the tropics, as noted by MARSHALL (1911) in the Sudan. When such a fluid is used to dilute the alcoholic stain, the organisms are fixed by the alcohol. They then sink and adhere to the film and become stained. The writer has seen this occur on several occasions and has been able to demonstrate the presence of flagellates in the water. It seems to him that the organism described by LEGER, M. (1919, 1920) as *Trypanophis malignus* from the blood and organs of cases of fever in French Guiana can probably be accounted for in this manner. The figure given by LEGER (1920) shows flagellate organisms which bear more than a striking resemblance to flagellates which the writer has seen in blood films and which he has been able to prove have originated from the distilled water employed for diluting Leishman stain. It is significant that LEGER (1919) compares his flagellate with *Haemocystozoon braziliense* described by FRANCHINI (1913) from the blood of a man who had resided in Brazil. There can be no doubt that in this case again the organism is the result of contamination, as pointed out by BRUMPT (1913), and it is not improbable that it found its way into the films from the water used in the staining process.

It is the opinion of the writer that haemogregarines of man have still to be discovered, and that the various organisms noted above, which have been interpreted as parasites by different observers, are not of this nature. If ever a haemogregarine of man be discovered it can safely be assumed that it will reveal more definite evidence of its real nature than that furnished by the forms described. It will be present in the blood more or less continuously and will not disappear rapidly from the circulation. The discovery of any problematic body in a blood film, especially when this occurs on only one occasion, must always be regarded with suspicion unless all other sources of its origin have been excluded.

REFERENCES.

Alexeieff, A. (1912). Le parasitisme des Eugléniens et la phylogénie des Sporozoaires sensu stricto.—*Arch. Zool. Exp. Gen.* [5], x, N. et R. p. lxxiii.

Balfour, A. (1905). A Haemogregarine of Mammals, *H. jaculi*.—*H. balfouri* (Laveran).—*Jl. Trop. Med. & Hyg.* viii. 241.

—— (1911). Fallacies and Puzzles in Blood Examination.—*Fourth Report, Wellcome Tropical Research Laboratories, Khartoum.* Vol. A. 109.

Bentley, C. A. (1905). Preliminary Note upon a Leucocytozoon of the Dog.—*Brit. Med. Jl.* May 6. 988.

Blanchard, R., & Langeron, M. (1912). Le Paludisme des Macaques.—*Arch. de Parasitologie.* (*Plasmodium cynomolgi* Mayer, 1907). xv. 534 & 542.

Bousfield, L. (1911). Remarks on Kala-azar in the Kassala and Blue Nile Districts of the Sudan.—*Fourth Report, Wellcome Tropical Research Laboratories, Khartoum.* Vol. A. 138.

Brumpt, E. (1910). Précis de Parasitologie. Paris. 158.

—— (1913). A propos de l'*Haemocystozoön brasiliense* de Franchini.—*Bull. Soc. Path. Exot.* vi. 377.

Castellani, A. (1914). Note on Certain Protozoa-like Bodies in a Case of Protracted Fever with Splenomegaly.—*Jl. Trop. Med. & Hyg.* xvii. 113.

—— & Chalmers, A. J. (1919). *Manual of Tropical Medicine.* 3rd Edition. pp. 489–490 & 537–538.

—— & Willey, A. (1905). Observations on Haematozoa in Ceylon.—*Quart. Jl. Mic. Sci.* xlix. 383.

Chalmers, A. J., & Kamar, A. (1920). *Toxoplasma pyrogenes* Castellani 1913. —*Jl. Trop. Med. & Hyg.* xxiii. 45.

Christophers, S. R. (1905). *Haemogregarina gerbilli*.—*Sci. Mem. Off. Med. San. Dep. Gov. India.* No. 18.

Dimond, L. (1917). Trench Fever or P.U.O., Associated with the Presence of a Haemogregarine.—*Lancet.* Sept. 8. 382.

Dobell, C. (1917). The " Haemogregarine " of Trench Fever. [Correspondence.]—*Lancet.* Sept. 22. 473.

Elders, C. (1911). Ueber eine klinisch und ätiologisch der Trypanosomiasis und Schlafkrankheit verwandte Krankheit bei Javanen auf Sumatra.—*Arch. f. Schiffs- und Tropen-Hygiene.* xv. 1.

Fedorovitch, A. I. (1916). Hémoparasites trouvés dans un cas de fièvre chronique.—*Ann. Inst. Past.* xxx. 249.

Franchini, G. (1913). Un nouveau protozoaire parasite de l'homme provenant du Brazil.—*Bull. Soc. Path. Exot.* vi. 156.

—— (1913). Nouvelle contribution à l'étude de *Haemocystozoon brasiliense*.—*Ibid.* 333.

James, S. P. (1905). On a Parasite found in the White Corpuscles of the Blood of Dogs.—*Sci. Mem. Off. Med. San. Dep. Gov. India.* No. 14.

Krempf, A. (1917). Sur un Hématozoaire endoglobulaire nouveau de l'Homme (*Haemogregarina hominis*).—*C. R. Acad. Sci.* clxiv. 965.

Langeron, M. (1920). Sur une Hémogrégarine d'un Macaque.—*Bull. Soc. Path. Exot.* xiii. 165.

—— (1920). Note additionnelle sur une Hémogrégarine d'un Macaque.—*Ibid.* 394.

Laveran, A. (1905). Sur une Hémogrégarine des gerboises.—*C.R. Acad. Sci.* cxli. 295.

Leboeuf. (1921). Megalosplenie et Hémogrégarine en Afrique équatoriale.—*Ann. Méd. et Pharm. Coloniales.* xix. 116.

Leger, M. (1919). Hématozoaire flagellé nouveau dans une pyrexie cliniquement non classée.—*Bull. Soc. Path. Exot.* xii. 80.

—— (1920). Pyrexie mortelle à Allure spéciale, causée par un Flagellé à la Guyane française.—*Ann. Inst. Past.* xxxiv. 481.

—— & Bedier, E. (1922). Hémogrégarine du Cynocéphale, *Papio sphinx* E. Geoffroy.—*C. R. Soc. Biol.* lxxxvii. 933.

Legras, S. (1918). Sur des formes hémogrégariniennes vues dans le sang et dans le tissu ganglionnaire des bovidés d'Algérie.—*Bull. Soc. Path. Exot.* xi. 274.

Low, G. (1917). The " Haemogregarine " of Trench Fever. [Correspondence.] —*Lancet.* Sept. 22. 473.

Manson, P. (1905). Notes on Two Cases of Febrile Tropical Splenomegaly (Kala-azar) and a Suggestion.—*Brit. Med. Jl.* Nov. 11. 1261.

Marshall, W. E. (1911). Kala-azar Commission to Investigate the Prevalence and Cause of the Disease in the Sudan.—*Fourth Report, Wellcome Tropical Research Laboratories, Khartoum.* Vol. A. p. 169 & Plate X.

Martoglio, F., & Carpano, M. (1906). Sopra un Caso di "*Haemogregarina bovis.*"—*Ann. d'Ig. Sperim.* xvi. 251.

Nattan-Larrier, L. (1922). Sur une hémogrégarine de l'homme. (Note préliminaire.)—*Bull. Soc. Path. Exot.* xv. 943.

Noc, F. (1922). Formes hémogrégariennes observées dans un cas d'anémie pernicieuse autochtone.—*Bull. Soc. Path. Exot.* xv. 936.

Nöller, W. (1913). Die Blutprotisten des Wasserfroches und ihre Übertragung.—*Arch. f. Protist.* xxviii. 313.

—— (1913). Die Blutprotozoen des Wasserfrosches und ihre Übertragung.—*Ibid.* xxxi. 169.

—— (1920). Kleine Beobachtungen an parasitischen Protozoen. (Zugleich vorläufige Mitteilung über die Befruchtung und Sporogonie von *Lankesterella minima* Chaussat.)—*Ibid.* xli. 169.

Plate, L. (1914). Brief note on *Toxoplasma pyrogenes*, Castellani, 1913.—*Jl. Trop. Med. Hyg.* xvii. 98.

Reichenow, E. (1910). *Haemogregarina stepanowi.* Die Entwicklungsgeschichte einer Hämogregarine.—*Arch. f. Protist.* xx. 251.

—— (1921). Die Hämococcidien der Eidechsen. Vorbemerkungen und I. Theil: Die Entwicklungsgeschichte von *Karyolysus.*—*Ibid.* xlii. 180.

Rocha-Lima, H. da (1912). Beitrag zur Kenntnis der Blastomykosen. Lymphangitis epizootica und Histoplasmosis.—*Cent. f. Bakt.*, etc. 1 Abt. Orig. lxvii. 233.

Roubaud, E. (1919). Un deuxième type d'hémogrégarine humaine.—*Bull. Soc. Path. Exot.* xii. 76.

Schüffner, W. (1911). Bemerkungen zu den von C. Elders auf Sumatra gefundenen Protozoenkrankheiten.—*Arch. f. Schiffs- und Tropen-Hygiene.* xv. 394.

Sergent, Ed. (1921). Sur l'hypothèse de l'évolution des *Sarcocystis* du Boeuf chez un insecte hématophage, hôte définitif.—*C. R. Soc. Biol.* lxxxv. 408.

Sergent, Ed. & Et. (1903). Sur un nouveau protozoaire, parasite ectoglobulaire du sang de l'homme.—*C. R. Soc. Biol.* lv. 1163.

—— Ed. & Et., & Parrot, L. (1922). Sur une hémogrégarine de l'homme, observée en Corse.—*Bull. Soc. Path. Exot.* xv. 193.

Wenyon, C. M. (1922). Leishmaniasis: A Review of Recent Literature.—*Trop. Dis. Bulletin.* xix. p. 184.

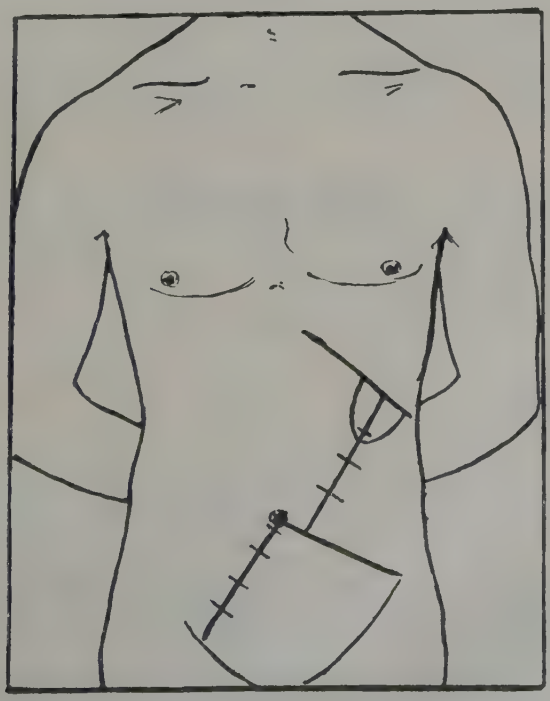
MALARIA.

Far Eastern Association of Tropical Medicine; Transactions of the 4th Congress. 1921. Vol. 1. pp. 469–475. With 1 plate.—**Discussion on the Determination of the Splenic Index.** [Schueffner, Christophers & de Jonge.]

Maxcy (Kenneth F.) & Coogle (C. P.). **Methods for Determining Malaria Prevalence—the Spleen Rate of School Boys.**—*Southern Med. Jl.* 1923. Apr. Vol. 16. No. 4. pp. 269–275. With 1 chart. [5 refs.]

Darling (Samuel T.). **Ascertaining the Splenic Index and the Mosquito Focus from School Children.**—*Jl. Amer. Med. Assoc.* 1923. Mar. 17. Vol. 80. No. 11. pp. 740–743. With 1 text fig. [5 refs.]

As Major Christophers puts it, speaking of the East, "The ease with which it [the splenic index] can be ascertained over large areas and for large numbers makes it a unique index in the measurement of disease, and to the malariologist it is one of the most precious assets of his science." Schueffner points out that its importance justifies the attempt to obtain a measure of the exposed spleen more accurate than that of finger-breadth, and suggests that a line should be drawn (see fig.) along the costal margin, another parallel to it through the



Schueffner's method for determination of the splenic index.

[Reproduced from the *Transactions of the 4th Congress of the Far Eastern Association of Tropical Medicine.*]

umbilicus, and a third joining these at right angles through the apex of the spleen. This last line is divided into four equal parts, and the spleen is designated as 1, 2, 3 or 4, according as to the point at which its apex lies. By running downwards and to the right from the umbil cus another line, parallel to the first measuring line, a second index is obtained for classifying larger spleens. Christophers points out that the actual measurements of the size of the uncovered spleen are deceptive, overlooking stature, and suggests that the qualitative index should be in this respect relative, not actual. This condition Schueffner's index fulfils, but Christophers believes that it may be vitiated by the fact that as the spleen enlarges the umbilicus shifts, being, so to speak, pushed before the spleen, and that the length of its exposed portion compared with that of some other portion of the individual should be used. The stature may be taken, but it is suggested that the nipple-umbilical line would be most readily measured by a tape which had just measured the exposed spleen. A committee of five was appointed to make and correlate the thousands of measurements necessary to determine the most accurate and usable index. They will doubtless decide whether objection to using the umbilicus as a terminal in the nipple-umbilical line will not hold equally with Schüeffner's marginal-umbilical line.

Maxcy and Coogle apply the spleen index, used quantitatively not qualitatively, to the south-east Missouri lowlands, and, comparing it with the history, parasite and Anopheles rates put to themselves two questions: Is it a measure of malarial prevalence? Is it large enough to be of practical use as such? The spleen rate was determined for 2,330 and the parasite rate for nearly 1,000 boys. Fifty per cent. of those showing parasites had enlarged spleens. Twenty per cent. of those having enlarged spleen showed parasites. The balance is held to be in favour of the splenic index, which was also found sufficiently large to be a practical factor in revealing malarial incidence. In communities, it is noted, sufficiently enlightened to ensure for themselves adequate medical treatment, the spleen rate will probably be low and afford an imperfect index of malarial incidence. It is held too as unlikely that where incidence is low the spleen rate in schoolboys will show small scattered foci; and that it is probably not worth while to determine the splenic index unless 25 or more per cent. of persons questioned give a history of chills during the preceding season.

A discussion taken part in by Ferrell, Bass, Russell, Heiser, Barber, Fricks and Carter is necessarily valuable. The following points among others were stressed. There is need, as a necessary preliminary to an antimalarial campaign, of an accurate measure of malarial incidence and variation, the actual incidence in an ordinary community being incapable of ascertainment. The reliability of all indices depends upon experience in the examiner. In establishing a parasite index a house-to-house canvas may be valuable. What is not known about the splenic index in America would fill a large volume. There was clearly general interest in the possible value of this index in the United States.

Darling notes Manson's contention that the peripheral blood findings may represent but an overflow from much greater visceral events and questions whether the splenic enlargement, the result of such events, may not be as trustworthy a measure of malarial incidence as clinical histories or the blood smear, at least as this last is usually made. He carries the matter a step further. In a Brazilian village

on the bank of the Rio Tiete, and straddling a small tributary, the splenic index of children in the two rows of houses nearest the river bank was 74, in the next five rows 26, in the next four rows 4, while further still from the river it was nil. Residence near the tributary stream (functioning as a sewer and too foul for Anopheles to breed therein) had no effect on the spleen rate. Guided by these facts, breeding-places were sought for, found and dealt with on the low land between river and village. The results, as indicative of the value of this line of intensive inductive reasoning, will be awaited with interest.

Clayton Lane.

Padua (R. G.). [In English & Spanish.] **On the Incidence of Splenic Enlargements in a Malarious District of the Philippines. Sobre la incidencia de la esplenomegalia en un distrito malarico de Filip nas.**— *Jl. Philippine Islands Med. Assoc.* 1923. Jan.–Feb. Vol. 3. No. 1. In English, pp. 1–6. In Spanish, pp. 33–38. [1 ref.]

In Iwahig Penal Colony comparison was made of the splenic, parasitic, haemoglobin and hepatic indices, nearly always in healthy adult males. The second was reached after the examination of both thin and thick preparations. Although in 163 new-comers the splenic and parasitic indices were respectively 4·29 and 0, and in 1,228 old inhabitants 48·78 and 15·06, yet among these latter persons no relationship was demonstrated between any of the four indices. The season and duration of the investigation are not indicated. Of 186 parasite positives 79·03 per cent. harboured *Plasmodium vivax*, 11·82 *P. malariae*, 1·61 *P. falciparum*, 4·84 the first and second, 2·15 the first and third, and 0·54 the second and third.

C. L.

Aievoli (E.). **Iper-splenomegalia malarica e sue complicazioni.** Excessive Splenomegaly and its Complications.]—*Riforma Med.* 1923. Jan. 29. Vol. 39. No. 5. pp. 104–105.

While the ordinary malarial enlargement of the spleen is without surgical interest, the writer has seen 17 cases with displacement, with or without torsion of the pedicle, acute, subacute or chronic; with infarction; with hydatid; with inflammation; or with traumatism.

C. L.

Seidelin (Harald). **Note sur le paludisme chez les Noirs.**— *Ann. Soc. Belge de Méd. Trop.* Brussels. 1922. Dec. Vol. 2. No. 2–3. pp. 209–212.

It has been assumed in the Belgian Congo that although the whites suffered, often severely, from malaria, the negroes were immune after childhood. Seidelin, by instituting the regular examination of thick films, the only means in his opinion of reaching exactitude in an overworked laboratory, has shown a heavy percentage of infection in adult negro males. His treatment is 0·75 to 1 gm of quinine hydrochloride consumed daily at the dispensary while fever lasts; and quinine, arsenic, and sometimes strychnine, for as long afterwards as the man will come for treatment.

C. L.

GARIN (Ch.). **Evolution du paludisme contracté en Orient chez les sujets de retour en France depuis l'armistice.**—*Lyon Méd.* 1923. Mar. 10. Vol. 132. No. 5. pp. 187–193.

In 311 cases repatriated to France from Africa malarial parasites have never been found in the peripheral blood beyond the end of the second year. It is concluded that RIEUX's views are correct [this *Bulletin*, Vol. 20, p. 294], except that the period required for the natural death of the infection should be doubled. Visceral manifestations definitely attributed to malaria and occurring more than two years after infection (that is after infestation is presumed to have died out) are splenomegaly, gallstones, nephritis and continued accesses of fever; but though definitely attributed to malaria, they are held to constitute no claim to an invalid pension. It may be noted that as regards the original diagnosis no note is made as to its basis and no indication given of the kind of malaria in question; that the subsequent presence or absence of malaria is based "in all but certain cases" on thin smears; that these "cured" cases exhibit a mean of 18 per cent. of large and medium sized mononuclears; and that only 51 of the 311 men had after "cure" as many as 5,000,000 erythrocytes to the cmm.

C. L.

ROSAL (Irene). [In English & Spanish.] **Malaria in Children. La Malaria en los Niños.**—*Jl. Philippine Islands Med. Assoc.* 1923. Jan.–Feb. Vol. 3. No. 1. In English, pp. 11–15. In Spanish, pp. 43–47.

In detailing the recognized peculiarities of malaria in children, the lack of periodicity is particularly stressed, and, in the absence of parasites, the discovery of malarial pigment in a leucocyte, leucopenia, macrophagocytic cells in the peripheral blood, and, last, the quinine test. The dosage of quinine bisulphate for age in centigrammes, and given three times a day is: 1 year, 5; 3 years, 10; 10 years, 20; 13 years, 40. [1 grain being 6·5 centigrammes.]

C. L.

ROSAMOND (Eugene). **Malaria in Children and the Abuse of Quinin.**—*Southern Med. Jl.* 1923. Apr. Vol. 16. No. 4. pp. 252–255. [5 refs.]

To combat the local opinion that, in regard to malarial diagnosis, the percentage of laboratory findings is low in proportion to actual infections, Rosamond examined the hospital records of 300 cases diagnosed as malaria. These showed that in 291 of them parasites were found, while the others had already had quinine; but this finding clearly does not affect the doubt as to whether other cases, many or few, were missed. It is stated, "hereditary transmission of malaria does not take place." On the other hand the harm which may follow the indiscriminate administration of large doses of quinine to infants is instanced by striking cases. A baby of 9 months received 20 gr. of quinine in one day, with coma and apparent death; one of 11 months had taken 16–20 gr. and one of 17 months 30 gr. daily, both with constant vomiting. So that one views with sympathy his real aim, which is to show that the indiscriminate use of quinine with no attempt to diagnose malaria is to be deprecated.

C. L.

Delamare (Gabriel). **Aperçu historique sur le paludisme.**—*Rev. pratique des Maladies des Pays chauds.* 1923. Feb. pp. 3–14.

This excellent historic digest cannot satisfactorily be condensed; nor will some of its admirable phrases bear translation. It is insisted that we need much further knowledge in certain directions [a matter stamped through the pages of this *Bulletin*]. In view of Donovan's find of infected aborigines in the notoriously unhealthy "uninhabited" forests about Ootacamund, it does not seem wise to use this argument in support of the suggestion that man is not the only host of his malarial parasites.

C. L.

Gill (C. A.). **The Prediction of Malaria Epidemics. With Special Reference to an Actual Forecast in 1921.**—*Indian Jl. Med. Res.* 1923. Apr. Vol. 10. No. 4. pp. 1136–1143. With 2 charts.

Christophers, in 1911, and Gill [this *Bulletin*, Vol. 17, p. 131] have shown that there exists in Amritsar, Punjab, a correlation between the July–August rainfall and malaria later in the year. Whether malarial incidence over the whole Punjab during October could be predicted from the local rainfall in July–August was tested in 1921, Gill committing himself deliberately in this matter. "Although it is recognized that further study is necessary . . . it is thought that the first formal forecast of epidemic malaria in the Punjab attained a degree of accuracy which justified its preparation." A sufficiently restrained statement, seeing that when epidemic malaria arrived at certain localities, much as anticipated, it found, thanks to this forecast, special travelling dispensaries already established there. Possibly the sanitary department will be encouraged by finding in certain quarters the malarial outbreak attributed to these dispensaries.

C. L.

Leger (M.), Bédier (E.) & Baury (A.). **Index paludéen de diverses localités du Sénégal durant la mauvaise saison.**—*Bull. Soc. Path. Exot.* 1923. Mar. 14. Vol. 16. No. 3. pp. 208–214. [3 refs.]

In a number of children living in eight different stations in Senegal the parasitic index, estimated in thin smears, varied from 45 to 85, as compared with 63 in Dakar, the capital, and 71 in Medina, the adjacent native village. Of infections, *Plasmodium falciparum* occurred in 78·3 per cent., *P. malariae* in 21, and *P. vivax* in 0·7; the corresponding figures for Dakar being 66·4, 33·7 and 0·8. In many stations *P. vivax* was altogether absent from the findings. In the subsequent discussion, Jouenne noted that the silk cotton tree can contain in its branches a cubic metre of water swarming with larvae, while the common "never-die" hedge always carries water at the origins of its branches.

C. L.

Leger (M.), Pinaud (J.) & Bédier (E.). **Le Paludisme à Zinder: index hématologique.**—*Bull. Soc. Path. Exot.* 1923. Feb. 14. Vol. 16. No. 2. pp. 137–141. [4 refs.]

Zinder, the headquarters of the French Niger Territory, with a comparatively healthy reputation, showed a parasitic index, presumably in thin smears, of 68·8 in 250 children examined. Of the infected,

66·5 per cent. harboured *Plasmodium falciparum*, 0·5 per cent. *P. vivax*, 29·34 per cent. *P. malariae*, and 5·58 per cent. both first and last. Extensive borrow-pits minister to anopheline needs throughout the year.

C. L.

CHRISTOPHERS (S. R.) & HARVEY (W. F.). **Malaria Research and Preventive Measure against Malaria in the Federated Malay States and in the Dutch East Indies.**—*Indian Jl. Med. Res.* 1923. Jan. Vol. 10. No. 3. pp. 759–771.

In coastal Java the breeding of *Anopheles ludlowi* in the economically important fish-ponds is the essential malarial factor, and has initiated the virtual movement of Batavia some miles inland to Weltevreden. In the Federated Malay States *A. umbrosus* is the coastal definitive host and can, it is held, be banished on flat land merely by clearing forest. On hilly ground the main definitive host is *A. maculatus*, breeding in connexion with seepage water, springs and streams. The effecting of its banishment lies in proper subsoil drainage, the method employed to accomplish this being that evolved by Malcolm WATSON. Through the red sandy loam of a ravine is cut a straight central drain 5 ft. deep, at the bottom of which are laid short, porous, earthenware pipes, 4, 6 or 8 in. in diameter. Their depth keeps them free of grass roots—a 12-ft. wide clearing, of tree roots—provided the drain is not on the flats. Similar drains branching from the main drain skirt the bottom of hill slopes, and are essential whether there be visible seepage or not. The pipes laid, these drains are, of course, filled. Open surface drains may also be essential in the soil (often turfed to prevent erosion) but they must not enter the zone of subsoil water or their permanently wet bottoms will ensure, instead of preventing, breeding of *A. maculatus*. They may have to be cemented, and usually the subsoil pipes make their final delivery into such a cemented open drain. Subsoil-drained land may be let out. Reclaimed flat land yields in Kuala Lumpur 3,000 dollars an acre. Reclaimed ravine land is usually agriculturally unproductive.

Cinchona cultivation in Java is considerable; 310 metric tons of quinine salts were exported in 1920, the British Empire taking about a third. To the possession of extensive plateau land with rich volcanic soil, a heavy rainfall at suitable altitudes, and the grafting of good yielding varieties of cinchona upon vigorous but poorer yielding stock, is ascribed Java's strong position. Sumatra's similar attempts have proved but little successful.

C. L.

DE SOUZA (R.). **A epidemia palustre das Fontainhas.** [An Epidemic of Malaria at Fontainhas.]—*Bol. Geral. Med. e Farmacia.* Bastora. 1922. Jan.–Dec. 8th Ser. Nos. 1–12. pp. 1–3. (Discussion pp. 3–5.)

At the meeting of the Medico-Pharmaceutical Association of Portuguese India, held on July 17, 1922, de Souza reported a local epidemic with these characters. The temperature nearly always rose to 105° or 107°; it was frankly intermittent; quotidian, tertian or double tertian in rhythm, yet of a benign nature; not yielding to quinine, but recovering after neosalvarsan in a dose of 0·45 gm. given irrespective of the temperature; attacking several persons in one family.

The evidence offered for the malarial nature of the epidemic is that in an unstated percentage of cases the laboratory found numerous gametes, generally those of the tertian parasite. [There is likely to be hesitation in accepting as malarial a frankly intermittent hyperpyrexia of good prognosis, unyielding to quinine, without schizonts in the blood and having such a markedly cohabitant distribution.]

C. L.

Godoy (Alcides) & Pinto (Cezar). **Estudos sobre Malaria.** [Studies in Malaria.]—*Brazil Médico.* 1923. Jan. 20. Year 37. Vol 1. No. 3. pp. 29–33. With 2 figs.

At Campos, in the State of Rio Janeiro, examination of the blood of 86 individuals for the presence of malarial parasites revealed 17 infected : 5 with *P. falciparum*, 4 each with *P. vivax* and *P. malariae*, 3 with both of these, and 1 with all three forms. The predominating species of Anopheles were *A. brasiliensis* and *A. argyrotarsis*, the former of which is said to convey quartan and malignant tertian, and *A. albimanus* transmitting the former only. *A. tarsimaculatus* was also found. Only 143 Anopheles in all were examined, and 59 of these were *A. brasiliensis* ; 1·6 per cent. were said to be infected. The numbers examined are too small for reliable inferences to be drawn from them.

H. Harold Scott.

[**Les travaux de la Commission yougoslave contre le paludisme ; contributions à l'étude du paludisme dans le Royaume des Serbes, Croates, Slovènes.**—*Radovi antimalaricne Komisije, I et II ; Prilozi za proncavanje malarije u nasim Krajevima*, Ministarstvo Narodnog Zdravlja S.H.S., Belgrad.] [Summarized in *Ann. d'Igiene.* 1922. Nov. Vol. 32. No. 11. pp. 900–902.

The work of this Commission shows that the war in Macedonia left 40 per cent. of those serving there with malaria, generally tertian, but of a virulence greatly surpassing pre-war days, approaching in type that of Albania, and with a mortality of 4 per cent. *Anopheles maculipennis* comprises 12·5 per cent. of the entire mosquito population, *A. superpictus* also appearing. In Dalmatia 80·5 per cent. of the population is proved malarial, 51·02 with quartan, 18·4 with tertian, 25·27 with subtertian, and 5·85 with mixed forms. In 1921 much rain fell and the daily oscillations of temperature are said to have amounted to 40° C.

C. L.

Tarassévitch (L.). **Expansion pandémique de la Malaria en Russie.** —*Bull. Soc. Path. Exot.* 1923. Feb. 14. Vol. 16. No. 2. pp. 71–74. [3 refs.]

In 1921 there were officially notified in Georgia (Russia) 300,000 cases of malaria against a normal annual mean of 25,000. In a part of Tiflis 5,179 cases and 486 deaths occurred among a population of 6,000. Baku registered 27,000 cases, with an infantile mortality of 40 per cent. Even in Petrograd an incidence of 15·2 per cent. was detected. These are but a few of the instances adduced, so that one cannot consider as exaggerated the estimate that 10,000,000 cases of

malaria occurred in Russia during that year. The suggested causes are the movements of troops and fugitives, famine, what is with gentle euphemism referred to as the general profound crisis, with its practically absolute cessation of antimalarial effort, and the inadequate supply of quinine. There one may, with Tarassévitch, leave the facts to teach their own sufficiently terrible lesson.

C. L.

Gordon (J.). **Ueber das Auftreten der tropischen Malaria in Deutschland, ihre Epidemiologie und Beziehung zum Salvarsan.** [Cases of Tropical Malaria in Germany, their Epidemiology and Relation to Salvarsan.]—*Klin. Woch.* 1923. Mar. 5. Year 2. No. 10. pp. 442–444.

Analysing 31 cases of subtertian malaria, autochthonous in Germany, and appearing after the injection of salvarsan, Gordon points out that as a provocative of latent malaria one injection of this drug may suffice; but that in the majority of the reported cases the malarial attack only showed after repeated injections; and that the usual interval after the last injection was 8–15 days. He quotes the English experience in which malaria has been accidentally conveyed by an unsterilized syringe, and advocates control, summer and winter, of mosquitoes round hospitals, administration of quinine on a doctor's order only, and the examination of a thick-drop blood preparation in every case.

C. L.

Adler (S.). **Malaria in Chimpanzees in Sierra Leone.**—*Ann. Trop. Med. & Parasit.* 1923. Apr. 18. Vol. 17. No. 1. pp. 13–18. With 2 plates.

Of 13 chimpanzees recently examined in Sierra Leone, two only were infected with a malarial parasite, which was indistinguishable from *Plasmodium falciparum*, both morphologically in schizont and gametocyte, and in its effect upon the erythrocyte. Both animals were under two years of age, both were weak and thin, and both died. This evidence suggests that immunity is acquired in later life, and it is held that it supports Reichenow's suggestion that such immunity results after repeated attacks in early life. Since Mesnil and Roubaud (this *Bulletin*, Vol. 17, p. 146) failed to infect chimpanzees (a young male and an adult female) with human blood containing *P. falciparum*, and Blacklock and Adler (Vol. 19, p. 588) failed similarly in infecting adult man from chimpanzee, and *Anopheles costalis* from the chimpanzee, it is held that the relationship between human malaria and that of the chimpanzee is still unsettled. Crescents were scanty in both animals, as is the rule for man in Sierra Leone. The injection of 0·4 cc. of blood [a quantity presumably held to suffice under the circumstances, although its crescent content is not mentioned], blood which had been free of rings for 16 days, into another, presumably an older animal, was followed by no malaria in the recipient. The salient findings after death were fatty degeneration of the liver, a few schizonts in the spleen of one case, and a few crescents in the bone marrow of the other. One had an enormous infestation with an immature *Oxyuris*.

C. L.

i. Ioff (I.). **Phagozytose bei Malaria.**—*Rev. Microbiol. & Epidemiol.* Saratov. 1922. Vol. 1. No. 3. pp. 290–291. With 1 plate.

ii. ——. **Ueber Erkrankung an Malaria im Frühjahr.** [Malarial Attacks in Spring.]—*Ibid.* p. 292.

iii. —— & Rumjanzew (W.). **Die Malariaepidemie im Sommer 1922 in den Bezirken von Nowousensk u. Dergatschi.**—*Ibid.* p. 294.

i. Pigmented leucocytes were found in thick-drop preparations, rarely in tertian and quartan, but in about half the cases of subtertian malaria. Phagocytosis, by polymorphonuclears, is held to occur just before, or even after, death, so that, if the patient be still seeking a prognosis, it is of the gravest import. [The abbreviations and misspellings in the German summary do not facilitate the elucidation of the author's meaning.]

ii. Since attacks which are clinically primary occur during winter and spring, before the temperature has reached the height of 15° C. held necessary for development of plasmodia in the mosquito, Ioff considers them to be cases which for some reason have an excessively long incubation period. [One would put this rather as an alternative mode of expression than an explanation.]

iii. The Saratov epidemic in 1922 affected 64·6 per cent. of the population, with a mortality of 1–2 per cent. In 129 thick-drop preparations the infection was subtertian in 86·6 per cent., tertian in 15·1, quartan in 3·5. In 6 cases infection was double.

C. L.

Velho (Assunção). **Um caso interessante de paludismo larvado. Ano de 1921.—Papeleta n.4 : 580, do H. de Loando.**—*Rev. Méd. Angola.* 1922. Sept. No. 3. p. 139.

A Belgian, 43 years of age, was admitted to hospital with muscular pains, drowsiness and general hebetude. He had been four months in Africa and in a tsetse fly district; the cervical glands were swollen. Forty-eight hours after admission he was semi-comatose with incontinence of urine, and had an attack of convulsions after which he improved somewhat, but next day again had incontinence of urine and of faeces also, and a syncopal attack from which he rallied. *P. falciparum* was found in large numbers in the blood. Quinine, 1 gm., was injected daily; the symptoms rapidly cleared up and the patient left hospital on the sixth day after admission.

H. Harold Scott.

Forbes (R. P.). **Congenital Malaria : Report of a Case in Colorado.**—*Amer. Jl. Dis. of Children.* Chicago. 1923. Feb. Vol. 25. No. 2. pp. 130–134. With 1 chart in text. [27 refs.]

A Greek woman had severe quartan malaria seven years ago. Two years later she reached the United States and has had no manifestation of malaria for the last four and three-quarter years. She was recently delivered of a 7-lb. child, which put on 2 lb. in the next seven weeks. It then experienced febrile attacks at intervals of 72 hours, and developed marked anaemia, with an enlargement of the spleen 2 in. below the costal margin, quartan parasites being present both in child and mother. Since Cockerell has found no anopheles in Colorado, it is held that they can be excluded as the cause of the malaria and that the case instances latent intrauterine infection. A bibliography of 36 cases is appended.

C. L.

DI PACE (Ignazio). **Contributo allo conoscenza del valore di alcune mezzi fisici usati per la diagnosi della malaria latente.** [Some Physical Agents as Provocatives of Latent Malaria.]—*Gaz. degli Ospedali e delle cliniche.* 1923. Feb. 4. Vol. 44. No. 10. pp. 114–116.

Many detailed observations indicate that fatigue, hot and cold baths, splenic massage, general cold douche and solar irradiation have little or no value as provocative agents in the diagnosis of malaria, while the injection of 2–3 mgm. of nitrate of strychnine is held to act promptly and safely.

C. L.

MARTONE (Vincenzo). **Il chinino nelle gestanti malariche.**—*Gaz. degli Ospedali e delle cliniche.* 1923. Jan. 11. Vol. 44. No. 3. pp. 30–31.

Quinine was given in 36 cases of pregnancy. Among 9 women, to whom were given by mouth small and divided initial doses, no cause for anxiety arose ; among 15 given by mouth large initial doses abortion was threatened in 3, though all went to term ; among 12 given hypodermic quinine, 8 aborted, and 2 more showed threatening symptoms which subsequently disappeared. Unfortunately the actual dosage is mentioned in none of these cases.

C. L.

RAVAUT (Paul). **Traitement du paludisme.**—*Rev. pratique des Maladies des Pays Chauds.* 1923. Feb. pp. 25–34. [3 refs.]

In the treatment of malaria it is recommended *ex cathedra* that quinine and arsenic be given alternately, each for two days. The quinine, however administered, is to be in daily doses of 2 gm. ; the arsenic, either in a single injection of 15–30 cgm. of novarsenobenzol on one of the two days, or an injection of cacodylate of soda on each of the two days, or 0·1 gm. of novarsenobenzol by mouth twice daily on each of the two days. The alternating treatment is to be continued for as long as is deemed necessary.

C. L.

SERGENT (Et.), FOLEY (H.) & CATANEL (A.). **Au sujet de l'élimination de la quinine absorbée sous forme de comprimés dragéifiés.**—*Bull. Soc. Path. Exot.* 1923. Jan. 10. Vol. 16. No. 1. pp. 21–22.

The writers have always found quinine tablets to be without the disadvantages so vividly expressed by BLANCHARD and so emphatically countered by other French writers [this *Bulletin*, Vol. 19, p. 872, and Vol. 20, p. 306]. Using for a dose a single ovoid, sugar-coated 20 cgm. tablet of the Algerian antimalarial service containing either sulphate or hydrochloride of quinine, they have made, with uniform results, seven experiments upon three persons. The test was by a freshly-prepared Tanret solution. In all of them evidence of excretion began in 2–2½ hours after ingestion, was at its maximum in 5–10 hours, and had disappeared in 27 hours.

C. L.

Filippella (Pietro). **Contributo allo studio sulla terapia della malaria con la cinconina.** [Cinchonine in the Treatment of Malaria.]—*Policlinico.* 1923. Apr. 9. Year 30. No. 15. pp. 464–470.

Twenty-three cases described in detail lead to the conclusion that for tertian malaria cinchonine in doses of 1·5–2·5 gm. can be substituted for quinine with therapeutic and financial benefit; that for subtertian malaria such substitution is advantageous in all but grave cases where rapid action is essential; and that a combination of quinine and cinchonine gives satisfaction.

C. L.

Laoh (Ph.). **A Simple Quinine Test for the Practice.**—*Meded. Burgerlijk. Geneesk. Dienst in Nederl.-Indië.* 1922. Pt. 4. pp. 266–267.

Four quinine tests are described, for use in urine:

1. Fluorescence. Precipitate chlorine by nitrate of silver. Add sulphuric acid to the filtrate. Although Ziemann states that in dilution up to 1 in 200,000 fluorescence appears, Laoh found it absent in 1 per 1,000.

2. Potassium-mercury-chloride. Solution A. Dissolve 27 gm. of corrosive sublimate in 1,500 gm. of hot distilled water; cool. Solution B. Dissolve, without heat, 100 gm. of potassium iodide in 500 gm. of distilled water. Mix A and B, and add 20 gm. of acetic acid; shake until the red precipitate entirely disappears. When added to quinine-containing urine a precipitate forms, soluble on heating, reappearing on cooling.

3. Thalleoquin. Make the urine, filtered and not too acid, yellow with bromine water; shake; run ammonia solution cautiously into the sloping tube. A green ring of thalleoquin forms between the two layers (soluble in alcohol, but not in ether) in quinine dilutions up to 1 in 7,500.

4. To cooled filtered urine add a few drops of picric acid. A cloudy, thin, diffuse opacity appears, disappearing on heating, and reappearing on cooling; whereas the precipitate of albumin increases on heating and falls on standing. It will be found effective when an adult has taken 0·2 gm. of quinine bisulphate an hour earlier, and is the test recommended for simplicity and effectiveness.

C. L.

Surbek (K.). **Zilversalvarsan en sulfoxylat bij malaria.** [Silver-Salvarsan and Sulfoxylat in Malaria.]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1922. Vol. 62. No. 6. pp. 741–745.

A recommendation of both drugs in treatment of benign tertian as well as subtertian fever. Sulfoxylat is a blood-isotonic, concentrated solution of salvarsan, ready for injection (single dose, 6–8 cc.). In crescent carriers an immediate effect was noted on the number of gametocytes circulating. In refractory cases the injection was followed immediately by the intravenous administration of 0·5–0·75 gm. quinine hydrochloride. The effect appeared to be lasting in 50 per cent. of the cases treated. In benign tertian cases fewer relapses were noted since this treatment was introduced.

W. J. Bais.

Jungbluth (Julius). **Zur Behandlung der Malaria mit Silbersalvarsan.** [Treatment of Malaria with Silver Salvarsan.]—*Deut. Med. Woch.* 1923. Apr. 27. Vol. 49. No. 17. pp. 545–546.

In 18 cases in which "other illnesses were excluded by the blood picture," injections amounting to from 50 to 80 cgm. of silver salvarsan gave satisfaction. There are mentioned three acute cases, in which, however, 1·5 gm. of quinine were given on remission; 7 anaemic; and 6 quinine resistant cases. It is advised that blood be not allowed to mix with the chemical in the syringe.

C. L.

Cheinisse (L.). **L'iode dans le traitement du paludisme rebelle à la quinine.**—*Presse Méd.* 1923. May 5. Vol. 31. No. 36. pp. 410–411. [1 ref.]

Roubachkine, following other Russian physicians, has used 5–10 drops of a 10 per cent. tincture of iodine, or 25–30 drops of a 1 in 50 watery solution containing also 2½ parts of potassium iodide, in cases of malaria resistant to quinine. Fever was suppressed, but parasites, with no evidence of degeneration, persisted in the peripheral blood. Further, in two cases in which crescents persisted under quinine they disappeared when iodine was combined with it. Iodine may be combined with quinine in injections by using antipyrin as a solvent, thus: In a porcelain mortar grind 0·2 parts of iodine and 3·5 of antipyrin, adding water to 10. Make up to 100 with a 10 per cent. solution of quinine bihydrochloride. Inject 5–10 cc. of the solution. Cheinisse observes that in 1846 Séguin had marked success with iodine in some quinine-refractory cases—and marked failure in others; while De Willebrand, in 1869, and Douaud, in 1871, strongly advocated iodine. He probably brings forward his observations in the hope that wider investigation may explain the great variations occurring after exhibition of a drug which has such far-reaching effects upon metabolism.

C. L.

Cignolini (Pietro). **Tre mesi di campagna radioterapia antimalarica nel Veneto.**—*Ann. d'Igiene.* 1923. Jan. Vol. 33. No. 1. pp. 19–25.

Radio-excitation in malaria comprises the administration of minimal doses of X-rays, varying with the individual's susceptibility from one quarter of a second to 40 seconds. The minimum for each individual must be correctly estimated and must not be exceeded. The rays are held to dominate the fever, eliminate quinine resistance, improve appetite, nutrition, energy, haemoglobin and colour, reduce the spleen rapidly and destroy the parasites.

C. L.

Aresu (Mario). **La velocità di sedimentazione del sangue malarico.** [The Rate of Sedimentation of Malarial Blood.]—*Riforma Med.* 1922. June 26. Vol. 38. No. 26. pp. 601–603.

An interesting paper, difficult to condense. Linzenmeier's method was used in order that the results might be compared with those of other authors. Twenty cases were examined, all proven malarial, and the estimations were made in the apyrexial periods. In a patient who had had an attack the previous day the sedimentation time was 9 minutes; in one who had been free for a week, 40 minutes; another, free for 10 months, 2 hours and 40 minutes. Normal blood took 5 hours or more.

The author enters briefly into a discussion as to the part taken by the corpuscles and by the plasma, and shows that the question is an intricate one. Each of the following points has to be taken into account: the volume and mass of the red cells, the specific gravity of the whole blood, the viscosity, the specific weight of the citrated plasma, and the height of the column of the citrated blood in the haemocrite, and until we know the physico-chemical aspects of the relations between the plasma and the red corpuscles no definite conclusions can be drawn.

H. Harold Scott.

Mayer (Edmund). **Ueber Eisenreaktion am Malariapigment.** [The Iron Reaction in Malarial Pigment.]—*Virchows Arch.* 1922. Dec. 30. Vol. 240. Pt. 1–2. pp. 117–126. With 7 coloured figs.

Seyfarth (*Verhandl. d. Dtsch. Pathol. Ges.*, 18 Tagung, Jena, 1921) has shown that tertian malarial pigment can be demonstrated to contain iron. The writer's beautiful figures show that using, in subtertian malaria, an acid alcohol solution of 2–5 per cent., instead of an acid watery solution, and allowing sufficient time for solution of the pigment, diffusion from it of iron can be demonstrated by Berlin or Turnbull blue. The reaction is capricious. Of adjoining cells one may show it, another not. Formol pigment does not so react.

C. L.

Monteverde (Juan A.). **Los fenómenos coloidoclásicos y la patogenia del acceso palúdico.** [The Phenomena of "Colloidal Shock" and the Pathogeny of Malarial Paroxysms.]—*Cronica Med.* 1922. Sept. Vol. 39. No. 711. pp. 341–356. [11 refs.]

The author quotes authorities for stating that colloidal shock produced by intravenous injection of colloidal gold, colloidal silver, peptone solution, anti-plague serum, is accompanied by the same changes in the blood as occur in anaphylaxis, namely, after an interval of 15–30 minutes there is an increase followed by a diminution of blood-pressure, with leucopenia, an inversion of the relative proportions of the polymorphonuclear to the other leucocytes, and an increase in the coagulation time of the blood. The same phenomena were found to precede and accompany a malarial paroxysm, and the author holds that rupture of the parasitized erythrocytes, in setting free the merozoites, throws into the circulation heterogeneous colloidal bodies which give rise to a blood crisis (crisis hemoclásica) and anaphylactic phenomena.

H. Harold Scott.

Allen (A. H.). **The Problem of Malaria in Marines in Haiti.**—*U.S. Nav. Med. Bull.* 1923. Jan. Vol. 18. No. 1. pp. 25–31.

During seven years' occupation of Haiti by marines, drainage, screening and antilarval measures have had no perceptible effect on the malarial incidence and death-rate of these men. The type is morphologically benign and clinically grave. It is urged that the source of infection in each camp is the Haitian town close to which it stands; and that an effort should be made through the French priest and local authorities to induce the inhabitants generally to quininize themselves at the expense of the United States. The wisdom of concentrating attention on anopheline, to the exclusion of culicine, breeding-places is stressed. The routine treatment is by the administration of 60 gr. of sulphate of quinine daily. That the vomiting induced by this dosage has necessitated recourse to intravenous medication will probably occasion no general surprise. The avoiding of infection by placing, as in India, the cantonment at a reasonable distance from the town is not mentioned.

C. L.

SPENCER (H. A.). **The Treatment and Prevention of Malaria.**—*S. African Med. Rec.* 1923. Feb. 24. Vol. 21. No. 4. pp. 84–87.

"'Hammer away while you live; *some* is bound to stick.' Is it true, I wonder?" a quotation in the last sentence of this paper, expresses adequately, and with the charm of varying metaphor, the attitude of one who has spent 20 years in trying to convince civil authority of the economic importance of malaria in the Transvaal. Nothing will, he is convinced, convert the scoffers but a local demonstration that adequate screening means absence of human malaria. Screen adequately and refuse to accept malaria as an adequate excuse for illness is his advice to the Government in its attitude to its servants, apparently irrespective of any duty which would force a man from the shelter of his home. Hostels, schools, hotels, boarding houses are, he points out, all capable of protection by government action, but its effectiveness depends on the users. In treatment, quinine with arsenic is advised and some success with "606" mentioned.

C. L.

i. RIEUX. **Le diagnostic du paludisme.**—*Rev. pratique des Maladie des Pays Chauds.* 1923. Feb. pp. 17–24. [1 ref.]

ii. MCCONNELL (Guthrie). **Positive Wassermann Test in a Fatal Case of Estivo-Autumnal Malaria.**—*Jl. Amer. Med. Assoc.* 1923: Apr. 21. Vol. 80. No. 16. p. 1123.

iii. SCHIFF (F.). **Ueber einige weitere Malaria tropica-Infektionen in Berlin.**—*Med. Klin.* 1923. Jan. 21. Vol. 19. No. 3. (945). pp. 84–87.

iv. PLETNEW (D. D.). **Ein Fall autochthoner Malaria tropica in Moskau.** [A Case of Autochthonous Tropical Malaria occurring in Moscow.] —*Arch. f. Schiffs- u. Trop.-Hyg.* 1923. March. Vol. 27. No. 2. pp. 66–67.

v. FULCHIERO (Antonio). **Sindrome di Addison e malaria.**—*Policlinico.* Sez. Prat. 1923. Apr. 2. Vol. 30. No. 14. pp. 426–431. [11 refs.]

vi. STRAKOSCH (W.). **Zur klinischen Malariadiagnose.**—*Muench. Med. Woch.* 1923. Mar. 16. Vol. 70. No. 11. p. 327. [9 refs.]

vii. MAROGNA (Pietro). **Contributo allo studio della infezione malarica nella chirurgia.** [Malaria in Surgery.]—*Policlinico.* Sez. Prat. 1923. Apr. 16. Vol. 30. No. 16. pp. 498–499.

viii. HORSLEY, Jr. (J. S.). **A Type of Postoperative Fever, Probably Malarial Relapse.**—*Jl. Amer. Med. Assoc.* 1923. Apr. 14. Vol. 80. No. 15. pp. 1065–1066. [1 ref.]

ix. RICCI (Omero). **Relazione medica su di una campagna antimalarica nel suburbio di Roma.** *Policlinico.* Sez. Prat. 1923. Mar. 12. Vol. 30. No. 11. pp. 337–338.

i. In the main a résumé of accepted considerations; continuous re-examinations of thin films are preferred to thick drop preparations.

ii. A man with a history of chancre 25 years earlier, and several intervening attacks of gonorrhoea, but with no clinical symptoms, died of subtertian malaria microscopically established. There had been during fever a Wassermann reaction of four plus. The necropsy revealed definite syphilitic lesions of the aorta, with involvement of the aortic leaflets.

iii. Four further cases falling ill with subtertian malaria in Berlin, two of them after the administration of salvarsan, lead to a renewed warning to medical men to expect them.

iv. Plasmodia were detected. He had resided continuously in Moscow for two years.

v. Three cases showed cutaneous bronzing, particularly of the external genitalia and areolae, pigmentation of mucosae, an arterial pressure of 90–100 mm. of mercury, asthenia, nausea, anaemia, lumbar and abdominal pain, vomiting and diarrhoea. The evidence offered for their malarial origin seems to be that they reached the malarial section of a military hospital and that they recovered under quinine.

vi. Flattening of the umbilicus justifies a diagnosis of malaria.

vii. Two abdominal operations, the subjects of which developed severe manifestations of unsuspected malaria, microscopically established, lead to the conclusion that those who have previously suffered from malaria should receive quinine before operation.

viii. Several blood smears examined from each of three cases revealed no malarial parasites, although fever with chills had followed severe operations. Recovery followed quinine. There was a history of "malaria" 29, 40 and "a few" years earlier.

ix. The figures quoted for different years and different places do not all seem comparable, but the writer's conclusions are that preventive quinine is most efficacious when given not merely to those with fever, but in the interepidemic period.

C. L.

KALA AZAR.

SHORTT (H. E.). **Record of Kala Azar Research Work carried out at the King Edward VII Memorial Pasteur Institute, Shillong, during 1922.**—*Indian Jl. Med. Res.* 1923. Apr. Vol. 10. No. 4. pp. 1150–1168. [11 refs.]

The paper records the results of the following experiments :—

(1) Possible infectivity of faeces.
(2) Possible infectivity of drinking water.
(3) Inoculation of animals.
(4) Miscellaneous.

Under (1) experiments are described in which dogs, monkeys and birds were made to ingest the faeces of kala azar patients over long periods. Seven dogs received from 12–157 feeds, seven monkeys from 6–165 feeds and five birds from 28–153 feeds of kala azar faeces. In no case did any indication of a leishmania infection occur (one monkey was not examined).

Under (2) an attempt was made to test the possibility of animals becoming infected with leishmaniasis through imbibing water which was being used for drinking purposes by natives—the idea being that this water might be contaminated with the faeces of insects which harbour flagellates allied to leishmania. Five monkeys received from 92–95 drinks of the water ; two dogs 8 or 9 drinks and twelve birds from 3–87 drinks. In no case did infection result (one bird escaped before examination).

Under (3) a description of inoculation experiments on 13 monkeys, 1 dog, 4 pigeons, 1 porcupine and 3 mice is given. Of the monkeys, which were inoculated either with human or monkey material, 10 became infected. Of the other animals one mouse alone gave a positive result and this one had extremely numerous leishmania in its organs. Experiments with invertebrates are also described. Caterpillars, mealworms, cockroaches and spiders were inoculated into the body cavity either with cultures of *Leishmania donovani* or with emulsion of the organs of infected monkeys. All these experiments were negative as regards leishmania infection except in the case of one caterpillar which was found to have an infection of the body cavity fluid a week after the inoculation. There were present active single and dividing flagellates.

Under (4) are described :—(1) attempts to infect a toad by inoculation into the lymphsac of cultures of *L. donovani* ; (2) attempts to infect a toad by feeding it with cultures of *L. donovani* ; (3) attempts to infect a mouse by inoculating it with crushed up lice previously fed on a kala azar case ; (4) attempts to infect caterpillars, slugs, spiders and mantis with natural insect flagellates (a *Crithidia* of a bug, *Anoplocnemis* sp.) ; (5) attempts to infect a mouse with the excreta of bed bugs fed on kala azar cases. All these experiments gave negative results. [ZOTTA has successfully infected invertebrates with natural insect flagellates ; this *Bulletin* Vol. 19, p. 105.]

Details of a method for staining the cultural forms of *L. donovani* are described. It is also stated that the " thick tails " of *L. donovani* are developed in the bed bug as readily as those of *Leptomonas ctenocephali*. They most usually appear in the preparations some time after the dissection of the bug.

Some remarks on fallacies in connection with leishmania work are worth noting. *Nosema adiei* occurs in *Cimex rotundatus* and may

lead to confusion with leishmania. The author notes that FRANÇA described in the salivary glands of plant bugs certain bodies which he regarded as the metacyclic or inoculative forms of the Euphorbia flagellate. It occurs to him that these bodies may in reality be Nosema like those occurring in the bed bug, which Mrs. ADIE mistook for leishmania. The structures figured by Mrs. ADIE as nematodes in the bed bug are probably closely coiled bundles of spermatozoa. As regards mice, the author describes as *Cryptococcus muris* a vegetable organism which he found in a considerable number of animals. It was oval or round, and measured, on an average, 4 by 2·1 μ. The bodies stained a dark blue and possessed a red dot resembling chromatin. Reproduction appeared to be by budding. The occurrence of these bodies in the tissues of mice raises doubts as to the nature of the uninucleated forms of flagellates described by FANTHAM and PORTER, and LAVERAN and FRANCHINI, as occurring in animals inoculated with insect flagellates. The organism is illustrated in the coloured plate and its resemblance to leishmania is evident. SANGIORGI (*Pathologica*, 1922, Aug. 15, No. 330, p. 495) has already described a Cryptococcus of mice which is possibly identical with the one noted by Shortt. Intestinal flagellates may readily escape from the intestine of mice if this is injured during post-mortem examination. In such cases smears of the organs frequently show these flagellates. The figures purporting to show *Giardia* in smears of the lung appear to the reviewer to resemble *Octomitus*.

C. M. Wenyon.

YOUNG (T. C. McCombie). **The Season of Onset of Kala Azar.**—*Indian Med. Gaz.* 1923. Feb. Vol. 58. No. 2. pp. 52–56. With 9 charts.

An enquiry into the time of onset of symptoms in cases of kala azar in various districts of Assam was undertaken with the object of obtaining information regarding the seasonal incidence of the disease. Histories of 5,011 cases were thus secured, with the result that an unexpected character revealed itself. There appeared to be two types of onset of kala azar, one of which occurs in the cold weather months in Nowgong and Sibsagar and the other in the hot weather months in the lower Assam Valley. It is suggested that these two types have somewhat different clinical characteristics and are possibly of different epidemiological significance in that they may be conveyed by different species of insects. The possible fallacies in the figures obtained are considered, but it is felt that the number of cases is large enough to eliminate any statistical error.

C. M. W.

NAPIER (L. E.). **An Analysis of the Clinical Picture in Kala Azar.**—*Indian Med. Gaz.* 1922. Nov. & Dec. Vol. 57. Nos. 11 & 12. pp. 406–412. With 3 figs.; 446–451. With 2 charts in text.

During the twelve months following March 1921 the author saw 581 patients which were diagnosed as kala azar or non-kala azar. Of these cases 362 proved to be kala azar. The history and clinical condition was recorded in detail, and the paper is an analysis of the information thus obtained. There are a large number of tables and charts illustrating the percentage of both kala azar and non-kala azar cases, showing any particular feature or symptom. The result suggests that although each point in the history and each clinical sign are individually of little value in arriving at a diagnosis the aggregate of evidence enables one to make a diagnosis with more accuracy than mere guessing.

C. M. W.

Brahmachari (U. N.). **Chemotherapy of Antimonial Compounds in Kala-Azar Infection. Part II. Dermal Leishmanoid.**—*Indian Jl. Med. Res.* 1923. Apr. Vol. 10. No. 4. pp. 948–952. With 2 plates & 4 figs.

This paper contains a further account of one of the cases of dermal leishmaniasis described by the author in a previous report (this *Bulletin*, Vol. 19, p. 551). It may be recalled that the body of the patient was covered with nodules due to leishmania. In the present paper it is stated that cultures were obtained from the nodules and that a monkey inoculated in the eyebrows developed local nodular lesions. The human case was one of kala azar which had been treated by antimony compounds. The skin condition supervened. It was found that leishmania had disappeared from the internal organs. The inoculated monkey likewise appeared to be free from a general infection.

The histology of the lesions in the human case are described ; they are very similar to those of oriental sore. It is stated that in smears from the nodules most of the parasites were extra cellular—the reverse of what occurs in oriental sore. [It is quite impossible to form an opinion as to the natural situation of parasites from the appearance of smears, for the cells are broken down in the process of preparing the film.]

C. M. W.

Panayotatou (A.). **Quelques cas de splénomégalie et de kala-azar autochtones chez les indigènes en Egypte.**—*Bull. Soc. Path. Exot.* 1922. Nov. 8. Vol. 15. No. 9. pp. 843–853. [1 ref.]

Phillips (*B. M. J.*, 23 July 1904, p. 195) was the first to record the existence of kala azar in Egypt. He saw two cases in Cairo. Two other cases were described by Petritis (*Iatriki Proodos*, June 1920) from Tanub in Upper Egypt. The present paper shows that of eight cases of febrile splenomegaly investigated by the author in Alexandria three were kala azar. The ages were 2, 14 and 15 years. The cases were treated with intravenous injections of tartar emetic and appeared to do well.

C. M. W.

Castorina (Giuseppe). **Cronaca della Leishmaniosi infantile a Messina e dintorni.**—*Pediatria.* 1922. Dec. 15. Vol. 30. No. 24. pp. 1173–1178. [1 ref.]

During the period October 1921 to September 1922 there were seen at the clinic at Messina 44 cases of kala azar in children. Treatment of these cases with intravenous injections of tartar emetic was undertaken, five in hospital and the others as out-patients : 24 were cured, 7 died, 6 were lost sight of, while 7 are still undergoing treatment. The details of the cases are given in tabular form.

C. M. W.

de Buen (Sadi). **Algunas consideraciones sobre el Kala Azar en España.**—Reprinted from *Rev. de Hig. y de Tuberculosis.* 1922. Oct. 31. Year 15. No. 173. pp. 253–259. With 1 map. [40 refs.]

The author reviews the records of the occurrence of infantile kala azar in Spain. He gives a list of 63 cases. It is not quite clear how many were diagnosed by spleen puncture, but apparently the majority were.

The disease has been recorded in practically all the provinces bordering the Mediterranean and also in the more central provinces—Madrid, Toledo and Caceres. The ages of the children varied from 6 months to 12 years and 52 of them were from 1–3 years old. C. M. W.

LABBÉ (Marcel). **Le kala-azar infantile d'origine française.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1923. Jan. 18. 3rd Ser. Year 39. No. 1. p. 10.

The author draws attention to the case of kala azar described by RENAULT, MONIER-VINARD and GENDRON noted in the present number of this *Bulletin* [see below]. They believed the case to be the first reported from France, but other cases have been previously recorded. LABBÉ, TARGHETTA and AMEUILLE (this *Bulletin*, Vol. 12, p. 198) reported two cases, and D'ŒLSNITZ, BALESTRE and DAUMAS (this *Bulletin*, Vol. 19, p. 550) another.

The author states that he saw a case which was undoubtedly the same disease, though a diagnosis by spleen puncture was not made. The child recovered completely though no specific treatment was undertaken. If this case is included, five cases of infantile kala azar have been recorded from France, a fact which points to the disease being more common than has been supposed [the case reported by BIZARD and TERRIEN noted in this number makes a sixth]. C. M. W.

BIZARD (E.) & TERRIEN (E.). **Cas de leishmaniose interne chez une adulte, contracté en France.**—*Bull. Soc. Path. Exot.* 1923. Feb. 14. Vol. 16. No. 2. pp. 89–91.

Kala azar in adults who have never left France has not previously been recorded. The paper described a case in a woman 32 years of age who appeared to have contracted the disease at St. Nazaire, near Nice, where two cases in children had previously been noted. The diagnosis was made by discovery of the parasite after spleen puncture.

C. M. W.

MALLARDI (Mario). **Comportamento del sangue e degli organi emopoietici nella leishmaniosi sotto l'influenza della terapia.**—*Pediatria.* 1923. Mar. 1. Vol. 31. No. 5. pp. 230–246. [19 refs.]

The paper contains an account of twenty cases of infantile kala azar which were investigated from the point of view of the cells which occurred in the bone marrow, spleen and blood.

In infantile kala azar, as is well known, the blood shows three abnormal features—leucopenia, lymphocytosis and oligochromaemia. These are associated with the appearance in the blood of immature cells of various types, not only normoblasts and other cells of the red corpuscle series but also myelocytes. In certain cases the latter may be so numerous as to produce the impression of pseudoleukaemia. The presence of these cells is an indication of grave involvement of the haemopoietic organs. During the course of treatment the blood gradually assumes its normal characters. The disappearance of the cells of the immature type may be traced in cases which are responding to antimony. In certain cases the blood picture does not improve, while cells of the immature type become more numerous. In such there is little to be gained by continuing the injection of antimony tartrate. C. M. W.

NAPIER (L. E.). **Further Practical Experience with the Aldehyde Test.** —*Indian Med. Gaz.* 1923. Mar. Vol. 58. No. 3. pp. 104–107.

The author has made a further test of the aldehyde reaction (formol-gel test) in cases of kala azar [see this *Bulletin*, Vol. 19, p. 546]. He finds that the reaction can be relied upon to give a definite and correct diagnosis in all cases of more than six months' standing. In cases of under six months' standing a positive result can be accepted as evidence of the disease, whereas a negative result cannot be regarded as an indication that kala azar is not present. The results obtained show that of 119 cases in which the aldehyde reaction was positive spleen puncture revealed leishmania in 110. It has already been demonstrated that in the first spleen puncture smear from cases of known kala azar parasites were found in only 90·8 per cent. Of the 119 cases in which the aldehyde reaction was positive it would be expected from this figure (90·8 per cent.) that parasites would be discovered in the first smear in 108 of these. Actually they were found in 110, so that it is highly probable that all the 119 were cases of the disease.

C. M. W.

NASSO (Ivo). **La reazione di Brahmachari nella diagnosi della leishmaniosi infantile.**—*Pediatria.* 1923. Mar. 1. Vol. 31. No. 5. pp. 225–229. [2 refs.]

BRAHMACHARI stated that the blood serum of cases of Indian kala azar diluted with two to three times its volume of distilled water gave a flocculation which was characteristic of this disease [see this *Bulletin*, Vol. 12, p. 198]. The author of the present paper investigated the reaction in cases of Mediterranean infantile kala azar. He finds that it is of no value in the diagnosis of the disease, for not only is it difficult to interpret the results but the flocculation occurs with the sera of forms of anaemia other than those due to leishmania.

C. M. W.

SEYFARTH. **Eine einfache Methode zur diagnostischen Entnahme von Knochenmark beim Lebenden.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1922. Dec. Vol. 26. No. 11. pp. 337–341. [4 refs.]

—— (Carly). **Die Sternumtrepanation, eine einfache Methode zur diagnostischen Entnahme von Knochenmark bei Lebenden.** [Trephining of the Sternum, a Simple Method for the Diagnostic Removal of Marrow in the Living Subject.]—*Deut. Med. Woch.* 1923. Feb. 9. Vol. 49. No. 6. pp. 180–181. With 1 text fig.

These papers describe a method of puncture of the sternum or ribs for obtaining bone marrow for diagnostic purposes. A small metal trephine with a crown 5·6 to 7 mm. in diameter is used. The skin over the sternum at the level of the third or fourth rib is incised for about 5 cm. down to the bone. The wound is kept open with an automatic retractor and the bone trephined by revolving the trephine with the fingers. Loss of resistance indicates a penetration of the cavity of the bone. Through the opening material can be extracted with a sharp spoon or platinum hook. The seventh or eight rib can be opened in a similar manner in the scapular line but the operation on the sternum is simpler.

C. M. W.

NAPIER (L. E.). **The Treatment of Kala-Azar by "Stibenyl." A Report of Ten Cases.**—*Lancet.* 1923. Feb. 10. pp. 280–283. [7 refs.]

The author gives an account of ten cases of kala azar treated in India with injections of stibenyl, nine by himself and one by MACKIE. The drug was prepared by Messrs. Allen & Hanburys, and was put up in ampoules as a powder, a "set" consisting of eight ampoules containing doses of from 0·1 to 0·8 grams. It was advised to give each dose intravenously in 2 per cent. solution in distilled water every other day to the total of 3·05 grams. The cases were treated on the lines suggested but in some the doses were smaller than those recommended, while the intervals were longer. Of the ten two were apparently cured, three died, while in the others the treatment gave no result and was discontinued in favour of sodium antimony tartrate, except in one case in which further treatment was refused. The reaction to the drug was in all cases bad. The statement accompanying the drug that it could be given intramuscularly to children led to a trial of this method. It was proved that such an injection could be very painful, in fact much more painful than intramuscular injection of other salts of antimony. It is concluded that the use of stibenyl in the treatment of kala azar has not been successful, that there is some factor other than that of the relative toxicity of this organic compound of antimony, and that this also probably applies to other complicated organic compounds, which should be used with the utmost caution. The curative effect of an antimony compound is not in direct proportion to its antimony content.

C. M. W.

RENAULT (Jules), MONIER-VINARD & GENDRON (Georges). **Kala-azar infantile d'origine française. Guérison par l'acétyl-p-amino-phényl-stibinate de soude (Stibényl).**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1922. Dec. 7. Year 38. 3rd Ser. No. 34. pp. 1624–1632. With 1 chart in text.

A child who contracted kala azar in Marseilles was treated with intramuscular and intravenous injections of stibenyl during a period of seven months. During the first three months injections were given every three days, and during the last four months every two days. The doses varied from 0·05 to 0·2 gm. and in all 14·76 gm. of the drug were given in 92 doses. A complete cure was obtained.

C. M. W.

NASSO (I.) & MALLARDI (M.). **Stibioresistenza e stibiointolleranza nella cura della leishmaniosi infantile. (Osservazioni cliniche e ricerche sperimentali.)**—*Pediatria.* 1923. Jan. 15. Vol. 31. No. 2. pp. 57–67.

Illustrating their remarks by a series of cases the authors draw attention to the fact that as in the case of arsenic-resistant trypanosomes and emetin-resistant amoebae so there exist antimony-resistant leishmania. This resistance may be primary or secondary. The former condition is acquired by the parasite before treatment is commenced, while the latter is the result of treatment with doses of the drug which are too small to kill the parasites or the use of a form of drug which is not easily assimilated. It is also noted that the host may be primarily or secondarily intolerant of antimony. In the first the patient reacts badly to injections from the start, while in the second

this intolerance appears during the course of treatment. The authors claim to have demonstrated that in cultures in N.N.N. medium the antimony-resistant strains are able to develop in solutions of antimony which are stronger than those which the non-resistant strains will tolerate.

C. M. W.

YORKE (Warrington). **The Treatment of Kala-Azar by "Bayer 205."** —*Brit. Med. Jl.* 1923. Mar. 3. p. 370. [1 ref.]

A case of kala azar in an Indian was treated by rectal injection of tartar emetic in distilled water. This was followed by disappearance of the fever, improvement in the general condition, rise in the number of leucocytes and apparently a diminution of the number of parasites in the spleen. The spleen and liver had not decreased in size, while the patient's weight had continued to fall. It was then decided to treat the case with Bayer 205. Doses of 0·25, 0·5, 1·0 and 1·0 grams were given intramuscularly on December 28, December 30, January 2 and January 5 respectively. These caused no untoward symptoms but brought about a rapid diminution in the size of spleen and increase in the weight of the patient. On January 20 a spleen puncture revealed no parasites while the spleen, which had been below the umbilicus, now reached only to one and a half inches below the costal margin. The formol-gel test was, however, still positive. The patient sailed for India on January 30, apparently in excellent health and having put on 14 lb. weight in one month.

C. M. W.

YOUNG (Charles W.) & VAN SANT (Helen M.). *Leishmania donovani* **in the Peripheral Blood.**—*Proc. Soc. Experim. Biol. & Med.* 1923. No. 4. pp. 219–222.

The paper refers to investigations on kala azar in North China.

As human serum and human red blood corpuscles in culture media inhibit the growth of leishmania a technique was devised for ridding the material inoculated to the tubes of both of these. The cultures were made by taking 10 cc. of blood from the vein of the patient in a syringe containing 2 cc. of 1 per cent. citrated Locke's solution. The mixture was immediately expelled into a flask containing 50–70 cc. of the same fluid. The contents were then divided into two parts in two 50 cc. centrifuge tubes which were centrifuged (750 revolutions per minute) for five minutes. The fluid separated into a supernatant cloudy fluid and a deposit of red cells. The cloudiness is due to blood platelets and some red cells. Extracellular leishmania were sometimes found in smears of this fluid. The supernatant fluid was separated and centrifuged at 1,400 revolutions per minute for five minutes. The sediment was inoculated into tubes of N.N.N. medium having a P_h of about 7·6. With this technique 115 culture tubes were made from 34 blood specimens of untreated cases of kala azar. Thirty-one, or 91 per cent., were positive as regards development of flagellates. Cultures from treated cases did not give such a high percentage of positive results. From cases which had received up to a total dosage of 12 milligrams of antimony cultures were obtained in 60 per cent., while from cases which had received more than 20 milligrams of drug cultures were not obtained. Spleen puncture material from untreated cases gave a percentage of 91 positive cultures; treated cases which

had received up to 12 milligrams of drug gave 77 per cent. positive cultures, while cases which had received over 12 milligrams of drug were uniformly negative.

The mononuclear and polynuclear leucocytes of the blood when they contain leishmania appear to be heavier than the other cells of the blood and are found at the lowest part of the sediment after centrifuging. Of twenty-seven smears of the sediment obtained from nine blood specimens of untreated kala azar cases intracellular leishmania were found in twenty-one. In treated cases the positive finds fell according to the quantity of drug which had been given.

C. M. W.

Banerjee (Dhirendra Nath) & Saha (Jugal Charan). **A Study of Blood Sugar in Bengalees in Health and in Kala Azar.**—*Calcutta Med. Jl.* 1923. Mar. Vol. 17. No. 9. pp. 109–114.

The paper, which consists mostly of a series of tables, gives the results of estimation of blood sugar in cases of kala azar and in normal Bengalees. It appears that in kala azar there is a fall in the sugar content of the blood, for in the normal Bengalees it was 0·103 per cent. while in kala azar cases it averaged 0·031 per cent.

C. M. W.

Nicolle (Ch.) & Anderson (Ch.). **Conservation du virus de la leishmaniose canine sur les chiens dans les laboratoires.**—*Bull. Soc. Path. Exot.* 1923. Mar. 14. Vol. 16. No. 3. pp. 171–173.

Previous attempts to maintain a strain of kala azar in dogs has met with failure. A further attempt has shown that a strain can thus be maintained if the animals are given a sufficiently large dose, preferably of an emulsion of the bone marrow which in dogs is the tissue most heavily infected. Intraperitoneal injection of 6–8 cc. of an emulsion is sufficient to produce infection. The strain, which was that of naturally infected dogs, is now at its sixth passage.

C. M. W.

Pedroso (Alex. M.). **Notes on the Biology of** *Leishmania tropica.*—*Amer. Jl. Trop. Med.* Baltimore. 1923. Jan. Vol. 3. No. 1. pp. 47–58.

Having maintained cultures in N.N.N. medium of several races of leishmania during some years, the author was led to determine the optimum conditions of the medium. It was found that the best agar to use was made as follows :—

Water	1 litre.
Agar	20 gm.
NaCl.	3–4 gm.

To 8·5 cc. of this agar when liquid in a test tube at 45° to 50° C. are added 1·5 cc. of defibrinated rabbit's blood. By varying the reaction of the medium it was found that there is a relatively great range within which leishmania will develop. If the acidity or alkalinity is too marked the medium acquires a dark brown colour and is not favourable to growth.

C. M. W.

Bidault (R.). **Le bouton d'Orient au pays des dunes (Oued Souf, Sahara Constantinois).**—*Bull. Soc. Path. Exot.* 1923. Feb. 14. Vol. 16. No. 2. pp. 92–93. [5 refs.]

Legrain (1917) believed that the Souf district of the Sahara, about 220 kilometres south-east of Biskra, was free from oriental sore and that any cases seen there were importations. Baqué (1921) believed that autochthonous cases did exist and in the present paper the author confirms Baqué's statement. Legrain's explanation that the disease was not present on account of the permeability of the soil and the absence of stagnant water, mosquitoes and fleas is thus incorrect.

C. M. W.

i. Christopherson (J. B.). **Leishmaniasis of the Skin resembling Lupus Vulgaris.**—*Proc. Roy. Soc. Med.* (Sect. of Dermat.). 1923. Feb. Vol. 16. No. 4. pp. 48–49. (Discussion, pp. 49–50.)

ii. ——. **Lupus Leishmaniasis : A Leishmaniasis of the Skin resembling Lupus Vulgaris ; Hitherto Unclassified.**—Reprinted from *Brit. Jl. Dermat. & Syph.* 1923. Apr. Vol. 35. pp. 123–131. With 3 text figs.

Both these papers deal with one of the two cases of oriental sore described by the author in a previous communication (this *Bulletin*, Vol. 20, p. 104). The typical sore had disappeared under treatment and in its place five months later there developed a series of nodules giving the impression of lupus. There was some doubt as to whether there was actually a superimposed tuberculous condition or whether the nodules were due to leishmania. The fact that a complete cure resulted from intravenous injections of tartar emetic points to the lesions being an unusual manifestation of cutaneous leishmaniasis.

The author remarks that oriental sore is not a local disease and cites, in support of this statement, the fact that one of the two cases developed a lupoid condition on the cheek while the original sore occurred on the arm. [It may be noted, however, that multiple lesions in oriental sore are common and that these do not necessarily appear at the same time. The possibility of autoinoculation cannot be excluded so that the author's statement cannot be accepted without some qualification.]

C. M. W.

Klotz (Oskar) & Lindenberg (Henrique). **The Pathology of Leishmaniasis of the Nose.**—*Amer. Jl. Trop. Med.* Baltimore. 1923. Mar. Vol. 3. No. 2. pp. 117–141. With 5 text figs. [20 refs.]

The authors describe the pathological changes which take place in the condition known as leishmaniasis of the nose as commonly seen in Brazil. It is always secondary to lesions on the skin. Involvement of the nose commences as an oedematous swelling of the cartilaginous part of the nasal septem. This swelling ulcerates and the condition spreads to other parts of the nasal cavity, finally extending backwards to the pharynx and downwards to the skin on the margins of the nostrils. Histologically there is primarily a perivascular lymphocytic infiltration of the submucosa. This is followed by a gradual increase in the number of plasma and endothelial cells, the latter finally forming aggregates or nodules. These nodules then necrose

and become fibrotic. There is a marked endarteritis, while leishmania are present in the endothelial cells at all stages of the disease. [At the commencement of the paper the authors refer to the parasite as *Leishmania americana* and at the end as *Leishmania brasiliensis*. Actually the parasite is undistinguishable from *Leishmania tropica*.]

C. M. W.

HARTMANN-KEPPEL (G. L.). **L'appendicite à Leishmania.**—*Presse Méd.* 1923. Mar. 28. Vol. 31. No. 25. pp. 291–292.

The author states that in North Syria oriental sore patients often suffer from various intestinal symptoms, anaemia and splenomegaly, and that these are not explained by the occurrence of concomitant malaria. A case is quoted of a woman who had an oriental sore of eight months' standing. She was operated upon for acute appendicitis and the appendix was much inflamed. An examination of serum from part of the appendix showed typical leishmania measuring 1–3 microns, not only in large macrophages but also in lymphocytes and free. The free forms apparently measured 1·75 microns. Each contained a round nucleus and a short centrosome. The author next remarks that in no case was an undulating membrane present—a statement which is unfortunate, for it raises doubts as to his knowledge of what leishmania should actually look like. The size of the parasites is smaller than leishmania usually are, so that it seems to the reviewer that it is possible that the author was confusing yeasts with leishmania. He says a dog was inoculated with the serum from the appendix. Four lesions developed of which three were somewhat different from oriental sore. No mention of parasites in these lesions is made.

It seems that the author's conclusion that a leishmania appendicitis exists as a complication of oriental sore requires confirmation.

C. M. W.

TEJERA (Enrique). **La leishmaniosis americana en Venezuela. Memoria premiada por la Academia Nacional de Medicina (1918).**—46 pp. 1919. Caracas: Imprenta Nacional.

This paper contains an account of leishmaniasis as found in South and Central America, especially with reference to Venezuela. The disease in Venezuela does not appear to differ from that in other parts of South America. No new information regarding the disease or its parasite is offered though the paper includes a record of certain flagellates in arthropods and Euphorbias.

C. M. W.

CERQUIERA (Augusto de Castro) & DE VASCONCELLOS (Amarilio). [**La leishmaniose à Rio de Janeiro.**]—*Bol. Sanitario do Departamento nacional de Sáude Publica.*—1922. June. No. 1. p. 35. [Summarized in *Bull. Office Internat. d'Hyg. Publique.* 1923. Jan. Vol. 15. No. 1, p. 123.]

During the period May to August 1921, there appeared what was apparently an epidemic of cutaneous leishmaniasis in Rio de Janeiro. In all 26 cases were seen which came from certain streets in the Santa

Thereza and Sylvestre quarters of the town. The houses from which the cases came were occupied by 127 persons, so that of these 20 per cent. were infected.

The disease is known in the rural districts around Rio but it is exceedingly sporadic, so that it appears impossible to explain the sudden outbreak within the town.

C. M. W.

Gastou & Tissot. **Sur un cas de leishmaniose de la face.**—*Bull. Soc. française de Dermat. et de Syph.* 1923. Vol. 30. No. 1. pp. 40–41.

The paper describes a case of oriental sore successfully treated with intravenous and local injections of salts of antimony. Intravenous injections of novarsenobenzol and local injections of emetine hydrochloride had failed to bring about a cure.

C. M. W.

Castellani (Aldo). **Treatment of Oriental Sore by Phosphorated Oil.** —*Brit. Med. Jl.* 1923. Feb. 17. p. 283.

The author advocates the treatment of oriental sore by the local subcutaneous injection of phosphorated oil (oleum phosphoratum B.P.). The oil (5 cc.) is taken into a syringe and injected into several places around and into the sore. This dose is repeated twice a week. Three cases are reported, the first being cured in six weeks, the second in three weeks, and the third in two months. The result in all three cases was very satisfactory, evidence of healing appearing after the second or third injection. It is essential to use only oil of recent preparation. The injections are practically painless but after a few hours there may be some local reaction, the lesion becoming slightly swollen and the skin reddened. The author remarks that he has used the oil in the treatment of rickets and osteomalacia and has given it as an adjuvant to quinine and arsenic in chronic malaria.

C. M. W.

Lindenberg (A.). **Ueber die Behandlung der brasilianischen Hautleishmaniose mit "Bayer 205."** [Treatment of Brazilian Cutaneous Leishmaniasis with "Bayer 205."]—*Archiv. f. Schiffs- und Trop.-Hyg.* 1923. Vol. 27. No. 2. pp. 64–66.

The paper describes a series of cases of cutaneous and mucosal leishmaniasis treated with various doses of "Bayer 205." The conclusion is reached that the drug has a decided specific action on the purely cutaneous lesions but the details of the progress of the cases which the author gives do not appear to justify this optimistic estimate of the effects of his treatment.

C. M. W.

Fraser (A. H.). **Notice of a Form of Ulcer prevalent at Delhi.**—*Jl. Roy. Army Med. Corps.* 1922. Aug. Vol. 39. No. 2. pp. 138–139.

This is an interesting reprint of a report describing Delhi boil or ulcer published in 1860. The author ascribes the cases he met with to the use of water impregnated with salts, chiefly nitrates, and recommends change of climate as the best cure.

E. G. Graham Little.

i. De (Monindra Nath). **A Case of Kala Azar with Fatal Bleeding.** —*Calcutta Med. Jl.* 1923. Mar. Vol. 17. No. 9. pp. 120–121.

ii. Faber (Harold K.) & Schussler Jr. (Hermann). **Leishmaniasis in the United States. Report of the Third American Case of Kala Azar and of a Case of Oriental Sore.**—*Jl. Amer. Med. Assoc.* 1923. Jan. 13. Vol. 80. No. 2. pp. 93–97. With 5 text figs. [14 refs.]

iii. Roy (D. N.). **Personal Observations on a Few Cases of Kala Azar.** —*Indian Med. Gaz.* 1923. Jan. Vol. 58. No. 1. pp. 23–24.

iv. Gupta (B. M.). **Antimony-Fast Kala-Azar.** [Correspondence.]—*Indian Med. Gaz.* 1923. Jan. Vol. 58. No. 1. p. 46.

v. Carrasco (Manuel Caeiro). **Revista sintética sobre as leishmanioses viscerais.**—Reprinted from *Med. Contemporanea.* 1922. 54 pp.

vi. de Buen (Sadi). **Apunte sobre la naturaleza de las células parasitíferas de los bazos leishmaniósicos.**—Reprinted from *Arch. de Cardiología y Hematología.* 1923. Vol. 4. No. 1. 2 pp. With 1 plate. [6 refs.]

vii. Sanjiva Rao (B.). **Kala Azar.**—Reprinted from *Madras Med. Jl.* 1923. Jan. & Mar. 56 pp. [9 refs.]

viii. Rodriguez Arjona (Vicente). [**Contribucion al estudio de las enfermedades tropicales. Leishmaniasis cutanea ulcerosa en la region oriental de la Peninsula de Yucatan.**]—*Soc. Méd, de Yucatan.* 1921. 8 pp. With 3 photographs. [Summarized in *Bull. Inst. Pasteur.* 1923. Mar. 15. Vol. 21. No. 5. p. 183.]

ix. Lambert (Robert A.). **Oriental Sore (Cutaneous Leishmaniasis) in the United States.**—*Jl. Amer. Med. Assoc.* 1923. Apr. 7. Vol. 80. No. 14. pp. 986–989. With 4 text figs. [5 refs.]

x. Plessier. **Observation d'un cas de leishmaniose cutanée (bouton d'Orient). Guérison par le stibényl.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1922. Dec. 7. Year 38. 3rd Ser. No. 34. pp. 1609–1613. With 1 text fig.

i. A case of kala azar in a woman, age 18, was complicated by the presence of a sloughing ulcer in the mouth. The ulcerated surface commenced to bleed profusely and, all attempts to stop the haemorrhage having failed, the woman died from exhaustion.

ii. The paper records a case of kala azar and one of oriental sore in children in the United States. Both were imported from Europe and attention is drawn to the danger of allowing the entry of such cases into the country.

iii. This paper deals with 26 cases of kala azar seen by the author in Purnea in India, but gives no new information.

iv. The author draws attention to five cases of kala azar from which parasites were recovered after a full course (2–2·5 gm.) of tartar emetic had been administered over a period of three months.

v. This pamphlet of 54 pages contains a general account of the various diseases caused by leishmania.

vi. As a result of the examination of a spleen smear from a case of kala azar, the author agrees with Ferrata that the cells which contain the leishmania are typical haemohistioblasts. A coloured plate figures these cells.

vii. The paper, which does not appear to contain any new information of importance, is mainly a review of our knowledge of certain aspects of kala azar.

viii. The author records the presence of cutaneous leishmaniasis in the eastern part of the peninsula of Yucatan.

ix. A record of two cases of oriental sore in Armenians who emigrated to America. This brings the number of cases noted during the last two years to ten. In one case the lesion did not appear till three months after the patient's arrival in the United States, and probably eight months after infection.

x. A case of oriental sore treated by intravenous injections of stibenyl was cured in a period of four months, during which injections were made three times a week in doses of 0·2–0·6 gm., to a total of 8 gm.

C. M. W.

RELAPSING FEVER AND OTHER SPIROCHAETOSES.

Kulescha (G. S.) & Titowa (N. A.). **Die pathologische Anatomie und Ätiologie der Komplikationen des Ruckfallfiebers.**— *Virchows Arch.* 1923. Mar. 16. Vol. 241. pp. 319–351.

The severity of the epidemic of relapsing fever which led to the investigations described in this paper was due to the fact that many of the cases suffered from a combined infection with the spirochaetes and a bacillus belonging to the paratyphoid group. The bacillus, however, cannot be recognized as one of the known paratyphoid organisms, for it differs in certain biological characters, serologically and in the fact that it gives rise to severe and persistent infections. A septicaemia is produced and this is followed by the formation of emboli in the capillaries of the various organs, especially the glomeruli of the kidneys. At the site of an embolus there develops a round-celled infiltration of a granulomatous character which has a tendency towards suppuration. This particular type of paratyphoid infection has not been noted before and occurs only in association with the spirochaete of relapsing fever.

C. M. Wenyon.

Carniol (A.). **Cirrhose atrophique récurrentielle.**—*Presse Méd.* 1922. Nov. 4. Vol. 30. No. 88. pp. 952–953.

A woman who suffered from relapsing fever associated with jaundice had three attacks but did not recover as was expected; various abdominal symptoms appeared and she eventually died. At the post mortem the liver was found to be cirrhotic and it is suggested that the cirrhosis was directly due to the spirochaete. Other recognized causes of cirrhosis were excluded.

C. M. W.

Kireeff (M.). **Arsalytbehandlung des Rückfallfiebers und der Malaria.** [Treatment of Relapsing Fever and Malaria with Arsalyt.]— *Münch. Med. Woch.* 1923. Feb. 23. Vol. 70. No. 8. pp.244–245. [4 refs.]

Arsalyt (synthetic Bimethylaminotetraminoarsenobenzol) can be injected intravenously to human beings in dose of 0·3 to 0·7 gram. Tested on cases of relapsing fever it was found to produce as good results as neosalvarsan, so that it is a suitable drug for treatment of this disease.

C. M. W.

Sézary (A.) & Pomaret (M.). **L'action spirillicide des composés arsenicaux 914 et 190 administrés par voie buccale.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1923. Apr. 26. Year 39. 3rd Ser. No. 13. pp. 595–596. [2 refs.]

The authors have tested the preventive and curative action of the two drugs, 190 of Fourneau and 914 of Ehrlich, when administered orally to fowls inoculated with *Spirochaeta gallinarum*. In the case of 914, 16 centigrams are sufficient and 8 centigrams insufficient for preventing infection when administered a quarter of to half an hour after inoculation of the spirochaetes. The corresponding doses for 190 are 14 centigrams and 7 centigrams.

At the height of the infection on the third day 25–30 centigrams per kilogram of body weight are necessary to effect a cure in the case of 914, and in that of 190, 30 centigrams. It was previously shown that when administered intramuscularly 914 was definitely more active than 190, whereas given by the oral method the two drugs are equally effective. It is possible that the same rule will apply in the treatment of syphilis and that 914 given orally will not have the marked superiority over 190 which it appears to have when injected subcutaneously.

C. M. W.

Jonescu (A. P.). **Action du trépol dans la spirochétose des Oiseaux.**— *C.R. Soc. Biol.* 1923. Feb. 3. Vol. 88. No. 4. pp. 289–290.

A single intramuscular injection of trepol (a suspension in oil of sodium and potassium tartarobismuthate) in a dose of 0·5 cc. per kilogram of body weight is found to cure chickens, geese and ducks of spirochaetosis. The birds tolerate this dose well, no local lesion results and the cure is both sure and rapid.

C. M. W.

Farah (Najib). **Castellani's Broncho-Spirochaetosis, Pneumonic and Asthmatic Varieties; X-Ray Examination; Treatment with Injections of Iodine.**— *Jl. Trop. Med. & Hyg.* 1923. Apr. 2. Vol. 26. No. 7. pp. 103–110. With 3 text figs. [54 refs.]

After a review of the various types of bronchial spirochaetosis the author adds to the list a series of new types—broncho-pneumonic and pneumonic, pleuritic, asthmatic, foetid and gangrenous. These were all diagnosed as types of the disease owing to the presence of spirochaetes in the sputa. Though he rightly says that the organism resembles very closely the buccal and dental spirochaetes which occur in the normal state his remarks about their differential diagnosis are hardly convincing.

Examination of the lungs by X-rays shows various degrees of loss of transparency, a condition which the author says "might as well be taken for phthisis."

The author appears to disagree with those writers who consider that arsenic is a specific for this condition. On the other hand he finds that injections of iodine preparations give very satisfactory results.

[It appears to the reviewer that the paper is most unscientific and the author produces no evidence whatever that the conditions he describes are due to the spirochaetes in the sputum of the cases he has observed.]

C. M. W.

Hogue (Mary Jane). *Spirochaeta eurygyrata.* **A Note on its Life-History and Cultivation.**— *Jl. Experim. Med.* 1922. Dec. 1. Vol. 36. No. 6. pp. 617–626. With 1 plate. [19 refs.]

The author describes the cultivation of *Spirochaeta eurygyrata* from human faeces. The best medium was obtained by adding 0·3 cc. of sterile serum water (pig serum diluted with three volumes of distilled water) to 15 cc. of 0·85 per cent. sodium chloride solution. The medium used varied in its P_h from 6·8–7·4 but P_h 7 gave the best results. After inoculation with a loopful of material the liquid was covered

with a layer of paraffin to prevent evaporation. In this medium the spirochaetes lived and multiplied along with bacteria for 8–12 days at 35° C. Pure strains were obtained by taking small drops on a cover glass. When a drop was obtained in which only a single spirochaete was visible on microscopic examination the corner of the cover glass was chipped off and allowed to fall into a fresh tube of medium. The pure strains showed a remarkable range in the size of the spirochaetes. They varied in length from 4–56 microns. Some were loosely coiled and flexible, others were tightly coiled and less flexible. There were no terminal flagella and they all had rounded ends. Under the dark field there was a dark line running the entire length of the body. It is evident that one and the same species of spirochaete may show marked variations in its morphological characters and that separation of species is much more difficult than has been supposed.

C. M. W.

Santos (Gaspar). **Uma epidemia de tifo recorrente em Saurimo.** [An Outbreak of Relapsing Fever in Saurimo].—*Rev. Méd. Angola.* 1922. Sept. No. 3. pp. 139–142.

A record of an outbreak of relapsing fever, which showed no unusual features. It was apparently due to *Ornithodorous moubata*, which swarmed in the district.

H. Harold Scott.

i. Mallannah (S.). **Relapsing Fever in Raichur.**—*Indian Med. Gaz.* 1923. Apr. Vol. 58. No. 4. p. 168.

ii. Mehta (B. N.). **Notes on Relapsing Fever in Bhavnagar.**—*Ibid.* 1922. Dec. Vol. 57. No. 12. pp. 456–457.

iii. Le Fanu (G. E. H.) & O'Brien (A. J. R.). **An Outbreak of Relapsing Fever.** [Correspondence.]—*Brit. Med. Jl.* 1923. Apr. 21. p. 698

i. A record of an outbreak of relapsing fever during the winter months in the villages round Raichur, Hyderabad.

ii. A description of an outbreak of relapsing fever in India in which 23 cases occurred.

iii. A record of a small outbreak of relapsing fever during March of the present year at Accra.

C. M. W.

i. Pagniez (Ph.) & Ravina (A.). **Un cas de bronchite sanglante à spirochètes datant de quatorze ans.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1923. Jan. 18. 3rd Ser. Year 39. No. 1. pp. 27–29. [1 ref.]

ii. Huizenga (Lee S.). **Bronchial Spirochaetosis.**—*China Med. Jl.* 1923. Feb. Vol. 37. No. 2. pp. 153–157; and *Amer. Jl. Trop. Med.* Baltimore. 1923. Mar. Vol. 3. No. 2. pp. 143–149.

i. The author describes the case of a woman who had been in the habit of coughing up blood-stained sputum each morning for 14 years. The most careful examination revealed no objective cause for the condition, which gave rise to no fever or other inconvenience. The sputum showed a peculiarity in that it changed into a red liquid when allowed to stand. This change is described as a sputolysis. Spirochaetes were found in the sputum, and it is concluded that the case was one of long standing bronchospirochaetosis. Treatment with various forms of arsenic had no effect.

ii. This paper describes the condition known as bronchial spirochaetosis as it occurs in North China. The disease was diagnosed as such by the discovery of spirochaetes in the sputum. Fowler's solution, four drops three times a day, has given the best results in treatment.

C. M. W.

RAT-BITE SPIROCHAETOSIS.

i. Row (R.). **Some Cutaneous Manifestations in Rat-Bite Spirochaetosis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1922. Oct. 19. Vol. 16. No. 4. pp. 203–216. (Discussion, pp. 216–222.)

ii. Nixon (J. A.). **The Infecting Agent in Rat-Bite Fever.** [Correspondence.]—*Lancet.* 1922. Dec. 16. p. 1304.

i. Rat-bite fever appears to be very common in India at the present time. It has existed there for centuries for it is referred to in ancient writings. The disease commences with the primary lesion inflicted by the rat. This varies in extent according as it becomes septic or not. It may heal quickly or become an extensive sloughing area. The secondary eruption varies in quality and quantity. It may be merely an exanthem, or papules or nodules may appear on different parts of the body. The spirochaete is most easily obtained by puncture of the zone of the primary sore and inoculation of the fluid into a mouse. Monkeys and guinea-pigs can also be infected. There has been considerable difference in the various descriptions which have been given of the spirochaete. The Indian strain is a short, fine organism without terminal flagella. It possesses one and a half or two turns but rarely three. As it differs from many of the spirochaetes described as the cause of rat-bite fever the name *Spirochaete petit* was suggested for it.

The author points out that in the article on rat-bite fever in Byam and Archibald's " Practice of Medicine in the Tropics " he is wrongly quoted as having attributed the disease to a streptothrix.

ii. The writer of the second note states that he disagrees with Dr. Row that rat-bite fever is always caused by the small spirochaete. He has seen cases of the disease in which the only organism discovered in the blood is a streptococcus of low virulence.

C. M. Wenyon.

Kasai (Katsuya). [**A Comparative Study of Rat-Bite-Fever Spirochetes and Rat Spirochetes.**]—*Saikingaku Zasshi* (*Jl. of Bact.*). 1922. Sept. No. 324. [Summarized in *Japan Med. World.* Tokyo. 1923. Mar. 15. Vol. 3. No. 3. p. 54.]

An investigation of the small spirochaetes which occur in rats has led the author to the conclusion that there occur in these animals two varieties. One of these, which he calls *Spirochaeta laverani* var. *morsus muris*, is the rat-bite-fever spirochaete and is virulent for animals, while the other is *Spirochaeta laverani* var. *muris* which is little virulent and is identical with the spirochaetes of albino mice and field mice. These conclusions are based on morphological and immunological studies.

C. M. W.

Mouchet & Guillermin. **Le premier cas de sodoku observé en Turquie.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1923. Feb. 15. Year 39. 3rd Ser. No. 5. pp. 202–204.

The paper describes a case of rat-bite fever in Constantinople. The spirochaete was discovered in smears of the epitrochlear gland and also in a guinea-pig inoculated with gland emulsion.

C. M. W.

INFECTIOUS JAUNDICE.

BLANCHARD (M.), LEFROU (G.) & LAIGRET (J.). **Spirochétose ictérigène épidémique observée sur des indigènes à Brazzaville (Afrique Equatoriale Française).**—*Bull. Soc. Path. Exot.* 1923. Mar. 14. Vol. 16. No. 3. pp. 184–193. [8 refs.]

This paper gives a fuller account of an epidemic of febrile jaundice which was briefly mentioned in a previous paper [this *Bulletin*, Vol. 20, p. 142]. The virus, which appears to be morphologically identical with *Leptospira icterohaemorrhagiae*, was recovered from the patients as well as from bugs collected in the beds. BLANCHARD and LEFROU (*loc. cit.*, p. 138) point out that they were able to transmit the virus from guinea-pig to guinea-pig by means of bed bugs even 38 days after the bugs had taken up the organism. Reference is made to NOC's account [this *Bulletin*, Vol. 17, p. 369] of the occurrence of Leptospira in the rats of Dakar. The virus was pathogenic to guinea-pigs, in which jaundice and haemorrhages occurred followed by death on the 21st day at the first passage, and more marked symptoms followed by death on the 36th day at the second passage. The third passage was not successful as the guinea-pigs failed to become infected.

The authors of the present paper had a similar experience with the virus obtained from a human case of the disease studied by them in Brazzaville. The Leptospira was passed successfully through four guinea-pigs, which became jaundiced and died in 25–29 days. At the fifth passage, though the animals became infected, there was no sign of illness and the virus was lost. The virus obtained from the bed bugs behaved in a similar manner.

It appears that the disease resembles Weil's disease very closely in its clinical features but there is strong presumptive evidence that it was conveyed by bed bugs from one human being to another, and this conclusion is supported by the successful transmission experiments conducted with bed bugs and guinea-pigs. In spite of the fact that Weil's disease does not appear to be insect borne, these authors consider there is not sufficient evidence to justify the conclusion that the epidemic jaundice of the Congo is caused by a distinct species of Leptospira.

C. M. Wenyon.

UHLENHUTH (P.) & ZUELZER (M.). **Ueber die biologischen und immunisatorischen Beziehungen des Erregers der Weilschen Krankheit (*Spirochaeta icterogenes*) zu der freilebenden Wasserspirochate (*Spirochaeta pseudoicterogenes*). (Zugleich ein Betrag zum Virulenzproblem.)** [Biological and Immunological Relations of the Organism in Weil's Disease (*S. icterogenes*) to the Free-living Water Spirochaete (*S. pseudoicterogenes*).]—*Arb. a. d. Reichsgsndhtsamt.* Berlin. 1923. Vol. 53. No. 2. pp. 525–542. (Reprinted from *Klin. Woch.* 1922. Oct. 21. Vol. 1. No. 43. pp. 2124–2131. With 3 charts.)

As has already been noted [this *Bulletin*, Vol. 20, p. 143] the authors have discovered in tap water a certain leptospira which resembles

Leptospira icterohaemorrhagiae both morphologically and in its virulence to guinea-pigs. With the object of testing the relation of the organisms occurring in Weil's disease and those in tap water anti-leptospira sera were prepared in rabbits. With these a series of experiments with cultures *in vitro* and in inoculated guinea-pigs were undertaken. The results are given in a series of tables. They demonstrate the close relationship of the organisms from the two sources and support the view of the water origin of Weil's disease. It is pointed out that the water leptospira has been found to be pathogenic for guinea-pigs only after its virulence has been enhanced in culture media. Direct inoculation of water to animals has never given rise to any symptoms. It is concluded that if such infections were possible Weil's disease would be much more common that it is and that some special condition must exist which enables the natural water form of the organism to gain a footing in a human being.

C. M. W.

VERVOORT (H.). **Spirochaeten bij acute koortsige ziekten van onbekenden oorsprong in de Tropen.** [Spirochaetes in Acute Febrile Diseases of Unknown Origin in the Tropics.]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1922. Vol. 62. No. 6. pp. 697–707. With 2 charts & 2 plates.

During an epidemic of an acute fever of benign type associated with rheumatoid and vasomotor symptoms and occasionally with a terminal rash and jaundice, the author in a few cases demonstrated the presence of spirochaetes in blood films, in cultures, in horse serum diluted with Ringer's solution and once in a guinea-pig inoculated with the blood of a patient. In the cultures the spirochaete resembled *Leptospira hebdomadis* and *L. icterohaemorrhagiae*. Guinea-pigs are very susceptible to inoculation and they frequently succumb to the infection.

W. J. Bais.

VAN DE VELDE (E.). **Bloedspirochaeten bij koortsen en Spirochaetosis ictero-haemorrhagica.**—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1923. Vol. 63. No. 1. pp. 153–163. With 6 charts and 14 figs. (English summary, p. 163.) [3 refs.]

VERVOORT [see above] isolated a leptospira which resembled *L. hebdomadis* from a case of unclassified fever in Sumatra. Repeated attempts were made to discover this organism in 430 fever cases admitted to hospital from July to October 1922. The organism was found in the blood of 23 of these, 9 of which had malaria and 2 typhoid fever. In the 12 cases in which no explanation of the fever could be discovered the illness lasted from three to five days. Only two of them had symptoms like those seen in fevers of the dengue group. No opinion is expressed as to whether the illness was actually due to the leptospira or not. The organism, which resembled a typical leptospira, is described and figured as possessing a fine membrane.

C. M. W.

Coles (Alfred C.). *Spirochaeta icterohaemorrhagiae* **in the Common Rat in England, with Remarks on the Minute Structure of these Leptospira (Noguchi).**—*Parasitology.* 1918. Nov. 20. Vol. 11. No. 1. pp. 1–9. With 1 plate. [11 refs.]

The author examined the kidneys of 100 rats taken in and around Bournemouth for *Leptospira icterohaemorrhagiae*. The organism was found in 91 of these. They were discovered by dark ground illumination and in stained smears. The material examined was obtained by making a thick emulsion of the kidney in a little saline solution. In order to stain the leptospira very thin films of this emulsion were made. When quite dry a few drops of distilled water previously made slightly alkaline were allowed to act on the film for 30 seconds. It was then stained in Giemsa without fixation for three or four hours. By this method the fine spirals were easily seen and these are illustrated in a series of excellent microphotographs. In the kidney of one rat a short spirochaete which appeared to be that of rat-bite fever was discovered.

C. M. W.

Grapiolo (F. L.), Fossati (V.) & Palazzo (R.). **Un cas de Spirochétose ictéro-hémorragique.**—*C.R. Soc. Biol.* 1922. Feb. 18. Vol. 86. No. 7. pp. 414–415.

Though rats have not been proved to harbour *Leptospira icterohaemorrhagiae* in Buenos Aires in spite of repeated search, the human disease occurs there as illustrated by a fatal case described in this paper. The diagnosis was made by discovery of the leptospira in the tissues of the case itself and in inoculated guinea-pigs.

C. M. W.

Apert (E.) & Broca (Robert). **A propos de deux cas de méningite lymphocytique avec issue favorable ; un cas spirochétosique et un cas de nature indéterminée.**—*Presse Méd.* 1922. Dec. 20. Vol. 30. No. 101. pp. 1093–1094. [21 refs.]

The paper describes two cases of meningitis in children which at first sight appeared to be tubercular. The fluid obtained by lumbar puncture contained large numbers of lymphocytes. The serum of one of the cases was proved to protect guinea-pigs against infection with *Leptospira icterohaemorrhagiae*. It is concluded that this was a meningeal form of Weil's disease. The nature of the other case is doubtful. Both children recovered.

C. M. W.

Anigstein (Ludwik). *Leptospira icterohaemorrhagiae* **in the Wild Rats of Warsaw.**—*Jl. Trop. Med. & Hyg.* 1923. Mar. 1. Vol. 26. No. 5. pp. 81–82.

A record of the occurrence of *Leptospira icterohaemorrhagiae* in 4 out of 40 wild rats examined in Warsaw.

C. M. W.

YELLOW FEVER.

PIETER (H.). **Quelques réflexions au sujet de la fièvre jaune dans la République Dominicaine.**—*Rev. Méd. et Hyg. Trop.* 1922. Nov.–Dec. Vol. 14. No. 6. pp. 236–241.

No cases of yellow fever have occurred in the Isle of San Domingo since 1892. This disappearance of the disease, which up to that date had been more or less continuously present, has been entirely spontaneous and is unassociated with any sanitary measures or change in the habits of the people or the mosquitoes. Though the island has been in free communication during the past twenty years with Cuba and other districts where yellow fever has raged, and no quarantine precautions were taken, the disease was not introduced. The author concludes that there is some unknown factor which leads to the natural disappearance of the disease from a community.

C. M. Wenyon.

CONNOR (M. E.). **Notes on Yellow Fever in Mexico.**—*Amer. Jl. Trop. Med.* Baltimore. 1923. Mar. Vol. 3. No. 2. pp. 105–116.

The paper is an epidemiological study of yellow fever in Mexico. The disease has been permanently endemic in Yucatán, Vera Cruz and Colima. There have been other centres, such as Campeche and Tabasco, but the disease eliminated itself owing to failure of susceptible human hosts as a result of commercial decadence. It is pointed out that commercial prosperity, which causes a constant influx of susceptibles, is one of the principal factors in maintaining the disease. Similarly in the plantations there will be true hacienda endemicity where crops are continuous and plentiful all the year round and fresh labour is constantly imported. Haciendas are frequently infected yearly during the harvest season. Economic depression has to be accepted as a factor which conduces to natural elimination of the disease, for the stationary population quickly becomes immune. Increase in transport facilities has been largely responsible for the spread of yellow fever in Mexico. Though it is admitted that babies are non-immune new comers, as yellow fever is essentially a place disease the author cannot see how children in the first three years of life play a vital part in perpetuating it. An interesting explanation of the increase of Stegomyia during the early days of the rainy season is given. Eggs which have been laid on the water's edge during the time that water is evaporating are left dry till the sudden rise due to rain, when they hatch in large numbers.

C. M. W.

Connor (M. E.) & Monroe (W. M.). **Stegomyia Indices and their Value in Yellow Fever Control.**—*Amer. Jl. Trop. Med.* Baltimore. 1923. Jan. Vol. 3. No. 1. pp. 9–19. [1 ref.]

The authors claim that the continuance of yellow fever in any locality is due to the regular infestation of non-immunes rather than to the new-born. The latter factor certainly plays a part, but it is only a minor one. The active areas of the disease in an endemic centre are where both mosquitoes and non-immunes congregate, as in the districts of cheap lodging-houses and hotels. Endemic centres are of two kinds, the city centres and the farm or hacienda centres. In both these centres the disease is maintained through the arrival of non-immunes—which in the case of the hacienda centres is imported labour. When the non-immunes have become immune and when, through fear of infection, non-immunes cease to arrive the disease will automatically subside. The value of Stegomyia indices is discussed. The most valuable index is that of the container, the index being the percentage of containers harbouring mosquito larvae. When there is free breeding without control the index approaches 100. It is recognized, however, that the index in no way indicates the true percentage of adult mosquitoes which emerge.

C. M. W.

Perrin (Tomás G.). **The Hepatic Lesions of Experimental Yellow Fever.**— *Amer. Jl. Trop. Med.* Baltimore. 1923. Jan. Vol. 3. No. 1. pp. 27–38. With 10 figs. [16 refs.]

The author has studied the histological changes in the liver of guinea-pigs infected with *Leptospira icteroides*. He notes that two main types of lesion occur, viz., fatty degeneration or dystrophic steatosis, acute and profuse, and insular necrosis. The fatty change affects the whole parenchyma and nucleus of the hepatic cells and destroys extensive areas of the glandular tissue. This condition has never been described in human and experimental infectious jaundice, whereas it is analogous to that found in human livers from fatal cases of yellow fever. The insular necrosis is similar to that observed in guinea-pigs suffering from experimental infectious jaundice. The changes in the liver of guinea-pigs cannot therefore be used as an argument against the aetiological significance of *Leptospira icteroides* in yellow fever. The paper is illustrated with a series of micro-photographs.

C. M. W.

Hoffmann (W. H.). **Vergleichende Blutuntersuchungen an Meerschweinchen bei experimenteller Infektion mit Gelbfieber und Weilscher Krankheit.** [Comparative Blood Examinations in Guinea-Pigs experimentally infected with Yellow Fever and Weil's Disease.]— *Ztschr. f. Immunitätsf. u. Experim. Therap.* 1 Teil. Orig. 1923. Jan 30. Vol. 35. No. 5–6. pp. 488–502. With 19 charts in text. [2 refs.]

Having shown in previous papers that the histological changes produced in the organs of guinea-pigs by *Leptospira icterohaemorrhagiae* and *Leptospira icteroides* are identical, the author now publishes a

detailed account of the changes undergone by the blood in these two conditions. In both infections the changes in the blood are the same, namely an increase in the number of leucocytes with a relative increase of lymphocytes and of the eosinophiles, heightened coagulability of the blood and rapid decrease in the number of the red blood corpuscles and quantity of haemoglobin.

These changes correspond with those seen in man in Weil's disease and are unlike those in cases of yellow fever. The author concludes that his experiments lend no support to the view that *L. icteroides* is the cause of yellow fever.

C. M. W.

LABORATORY METHODS.

ALPORT (A. Cecil). **The Blood Count. Improvements in Method.**—*Lancet.* 1922. Oct. 7. pp. 756–758.

In this communication it is recommended to use an accurately ground cover glass 3·8 mm. thick (obtainable from Messrs. Hawkesley & Sons, Wigmore Street, London, W.) in place of the thinner cover slips ordinarily supplied with counting outfits of the Thoma-Zeiss type. The thickness of the cover glass necessitates the use of a low power lens of good working distance ; but, combined with an 18 compensating eyepiece a $\frac{2}{3}$ in. objective gives an excellent field for counting although the squares are slightly smaller than in the ordinary method.

It is pointed out that pipette, counting slide, and cover glass must be absolutely clean and dry, and solutions filtered ; and that, in order to obtain even distribution of the cells on the counting slide, speed in taking the blood, rotation and vigorous shaking of the pipette, care to discard the fluid in the capillary tube which contains no corpuscles, and rapidity in applying the cover glass are essential. All that is claimed for the thick cover glass method is that it assures absolutely accurate contact (shown by perfect Newton's rings all round the counting chamber), that the depth of the counting chamber is exactly $\frac{1}{10}$ mm. all over (no buckling of the thick cover glass being possible), that with a $\frac{2}{3}$ in. objective and an 18 compensating eyepiece the field is an excellent one, and that, being quick and easy, valuable time is saved by its use.

J. D. Thomson.

i. JOFF (I.). In Russian. [Abridged Version in French.] **Sur la méthode d'examen du sang dans la goutte épaisse.**—*Rev. Microbiol. et Epidemiol.* Saratov. 1922. Vol. 1. No. 1. p. 75.

ii. SINTON (J. A.). **A Possible Fallacy in the "Thick-Film" Method of Examination for Malarial Parasites.**—*Indian Jl. Med. Res.* 1922. Oct. Vol. 10. No. 2. pp. 592–594.

i. As a simple, quick and convenient modification of the "thick-drop" method of examining the blood for diagnostic purposes, the author of the paper under review recommends the following :—Allow the drop (or thick smear) of blood to dry on the slide. Dissolve out the haemoglobin with 1 per cent. acetic acid, pouring (not washing) off the acid containing the dissolved haemoglobin. Allow the preparation to again dry thoroughly in air and then stain for 2–5 minutes in a mixture of 1 per cent. methylenblue (5–7 parts), 1 per cent. carbolfuchsin (1 part), and water (10–15 parts) ; or in some other suitable staining mixture.

The author claims good results with this method in relapsing fever, and thinks it may be useful in the leucocyte count and in the cell-diagnosis of exudates ; but in this abridged version reference is chiefly made to its use in malaria in which he says "it deserves to be more widely employed" and "cases of malaria in which no parasites are found are rarely met with in examinations of the blood by the thick-drop method." [The reviewer thinks that a word of caution should accompany these remarks about malaria. The "thick-drop" method may facilitate the search for such distinctive forms as crescents when these are very scanty ; but used as a routine measure, unchecked by

the examination of thin films, it will more often lead the inexperienced into diagnostic errors. A much more satisfactory, and a quite expeditious, method is to smear well-stained ordinary thin films with a thin layer of cedar-wood oil and to examine these with a good dry lens, such as an 8 mm. apochromatic in combination with an 8 or 12 compensating eye-piece. With this combination a slide may be examined much more quickly than with an oil immersion lens, and even the smallest ring forms can, with a little practice, be readily recognized, and, if necessary, the diagnosis may be confirmed by turning on the oil immersion. Time may further be saved by running along the upper and lower margins before examining the rest of the smear.]

ii. Another possible source of error is pointed out in this note. While routine blood examinations of malarial cases undergoing treatment were being carried out in the author's laboratory one day all the thin films were returned as negative and all the " thick " films as positive. The thick films had been dried in air, dehaemoglobinized with distilled water, fixed in methyl alcohol, and stained in Giemsa. The distilled water used on this particular day had been stored in bottles for some time, and was afterwards found to contain ciliates and flagellates. These protozoan organisms had apparently got entangled in the loose meshes of fibrin, while the " thick " films were being dehaemoglobinized, were afterwards fixed in the methyl alcohol and stained in the Giemsa, and had been mistaken for malarial parasites. The author remarks that " the fallacy might occur very easily during the hot weather in the tropics." [This particular fallacy may, of course, as the author points out, be avoided by using sterile bottles and freshly prepared distilled water, or distilled water tested and found free from organisms ; but the mere fact of these organisms having been mistaken for malarial parasites in the " thick films " by workers presumably not altogether inexperienced shows that it is not always safe to rely on the " thick drop " method alone for the recognition of malarial parasites.]

J. D. T.

Romby (Paolo). **Studi sulla Malaria.** [Studies in Malaria.]—*Giorn. di Med. Milit.* 1922. Oct. 1. Vol. 70. No. 10. pp. 449–460. [25 refs.]

A method of staining blood films is described at pp. 458–459 in which methylene blue is rendered polychrome by mixing an alcoholic solution of the dye with an acid carbonate of calcium. Three solutions are used :—(1) *Fixing Fluid.* To 30 cc. of absolute alcohol are added 4 drops of a 1 per cent. solution of picric acid in alcohol and 1 drop of glacial acetic acid. For dropping a capillary tube of 3 mm. diameter is used.

(2) *Stain.* Methylene blue, 60 cgm. ; absolute alcohol, 30 cc. ; 0·01 per cent. caustic potash, 100 cc.

(3) *Calcium solution,* which must not be more than three or four days old and is to be added to the stain at the time of employment. A stock solution containing 1 decigramme of bicarbonate of sodium and 2 decigrammes of carbonate of calcium in 100 cc. of distilled water is made ; of this 4–5 cc. are added to 100 cc. distilled water just before use.

The process of staining is as follows :—The film is fixed by covering it with picric-acetic solution for 10 minutes and then immersed in the staining fluid freshly prepared by mixing 20 drops of the methylene

blue solution with 40 cc. of the solution of lime, well shaken. The film is allowed to remain in this for one minute, then rapidly treated with a weak solution of acetic acid, 1 drop in 100 cc., washed and dried.

The erythrocytes stain a more or less intense yellow, the cytoplasm of the parasites stains blue, the chromatin red or reddish violet, the protoplasm of the leucocytes blue, their nuclei violet, the granules deep blue or pink, and the platelets red.

H. Harold Scott.

Felice (Durand). **Un nuovo metodo di colorazione vitale del sangue.** [A New Method of Vital Staining of Blood.]—*Riforma Med.* 1922. Sept. 18. Vol. 38. No. 38. p. 893.

Saturated solutions of brilliant cresyl-blue and Sudan III are made separately and an equal volume of pure glycerine is added to each. After filtration the two solutions are mixed and alcohol to 2 per cent. is added. The author claims that this stain is especially good for observing the Sudanophilic granules, and for the ortho- and meta-chromatic substances of the red corpuscles.

H. Harold Scott.

Lyon, Jr. (M. W.). **A Simple Method of using Giemsa's Blood Stain.** —*Jl. Amer. Med. Assoc.* 1923. Feb. 17. Vol. 80. No. 7. p. 473.

This may be a useful method to the practitioner in staining occasional slides for diagnostic purposes. It is simple, convenient, and saves time and stain when only one or two slides have to be stained. The dried blood film is fixed in methyl alcohol for about a minute and again allowed to dry. The film is then covered with distilled water and from 3–5 drops of Giemsa's stock solution are added at different points. The slide is then gently rocked to ensure uniform mixture of the stain and water without overflowing the sides of the slide. The mixture is allowed to act for about 15 minutes and is then flushed off and the slide washed in distilled water until the film assumes a pinkish colour.

[If distilled water is not available, rain or tap water may be used ; and if methyl alcohol is not procurable, absolute alcohol, or equal parts of alcohol and ether, may be substituted, though the results may then be not quite so sharp and clear.]

J. D. T.

Giemsa (G.). **Das Wesen der Giemsa-Färbung.**—*Cent. f. Bakt.* 1. Abt. Orig. 1922. Nov. 18. Vol. 89. No. 4/5. pp. 99–106. [14 refs.]

A paper by Unna with the same title is referred to in this *Bulletin*, Vol. 19, p. 787. Giemsa's views on the subject differ substantially from those expressed by Unna. In the present communication, and in order to elucidate the points at issue, he puts two questions and then discusses how Unna and he would answer them.

1. Is Azur by itself able to give the typical Romanowsky-Giemsa, bright-red colour reactions of the nucleus, or is Eosin necessary for this and is it tinctorially concerned in the colouring ?

2. How is one to explain the "metachromatic" action of Azur which, among other things, shows itself in the nuclei being stained by this dye, even without the addition of Eosin, red-violet, and the mast-cell granules pure red, while the rest of the cell appears blue?

Giemsa says that UNNA, in attributing the typical red-reaction solely to Azur, confuses, or fails to distinguish between, the bright-red Romanowsky colour and the "metachromatic" violet, or red-violet reactions of the nuclear substance. Azur by itself stains the nucleus "metachromatically" blue-violet or red-violet; but to obtain the typical bright-red Romanowsky reaction the presence of the Eosin is necessary. This typical reaction is also obtained by successive staining, first with the basic dye (Azur) then with the acid (Eosin), but not in the reverse order. These results, Giemsa holds, show that the basic dye alone is unable to give the typical bright-red nuclear reaction and that the Eosin is not only indispensable but participates "tinctorially" in its production. He looks upon the process as one of "mordant-dying" in which a colour base (azur base) mordants the acid nucleus so that ultimately it can take up a colour acid (Eosin acid) to which, unmordanted, it has scarcely any affinity. Similarly, when the Giemsa stock solution is largely diluted with water, the Azur II Eosin, he suggests, becomes dissociated and the basic dye (Azur) mordants the acid nucleus so that it takes up the acid dye (Eosin).

The metachromatic action of the Azurs, which expresses itself not only in the red-violet staining of the nuclear substance but also in the pure red colouring of mastcell granules is, he considers, explained more naturally by the tendency of these dyes to "Tautomerism" than by UNNA's assumption that it is due to the red anhydride of Azur, or the red anhydrides of its components.

Although it is the methylenazur, not the methylenblue, that shares in the production of the typical bright-red nuclear reaction, the presence of methylenblue in the Giemsa stain is nevertheless advantageous because it colours the cytoplasm of the cell deeper, and of a purer blue, than Azur alone, and in this way it contributes substantially to the picture as a whole, and to good differentiation.

J. D. T.

WARTHIN (A. S.) & STARRY (A. C.). **The Staining of Spirochetes in Cover-Glass Smears by the Silver-Agar Method.**— *Jl. Infect. Dis.* 1922. June. Vol. 31. No. 6. pp. 592–600. With 8 text figs.

The authors believe that the method which they here describe of demonstrating spirochaetes in cover glass smears is "the surest and safest diagnostic method yet devised." They recommend it to "bacteriologists and laboratory workers engaged in spirochaete studies," but "its greatest value," they consider, "is in its application to the clinical diagnosis of syphilis."

Full directions are given and these should be carefully followed by anyone wishing to acquire the method. They cannot be usefully summarized.

Eight figs. accompany the paper. These show photomicrographs of (1) *Spirochaeta pallida* in smear from chancre. (2) Two types of spirochaetes, the ones most commonly mistaken in the dark-field for *pallida*, in smear from gums. (3) *Spirochaeta obermeieri* in smear of rat's

blood. (4 and 5) *Spirochaeta icterohaemorrhagiae* in smear from old culture. (6) *Leptospira icteroides* in smear from guinea-pig's liver. (7 and 8) Ditto in smear from macerated guinea-pig's liver.

J. D. T.

i. Kofoid (C. A.). Kornhauser (Sidney S.) & Swezy (Olive). **Technique for Staining the Amoeba with Iron Haematoxylin.**—*China Med. Jl.* 1922. Sept. Vol. 36. No. 5. pp. 406–407.

ii. Shortt (H. E.). **Note on Iron Haematoxylin Staining.**—*Indian Jl. Med. Res.* 1923. Jan. Vol. 10. No. 3. p. 836.

i. Though adding nothing to the usual technique, a clear and concise account of procedure for the selecting, smearing, fixing, staining and mounting of material is here given.

ii. In this note the following procedure for preparing a haematoxylin solution that can be used immediately (*i.e.* without having to wait for it to "maturate") is described :—

"To 95 cc. of distilled water in a flask one adds 1 gm. of pure haematoxylin crystals (Grubler for preference). This solution [mixture] is slowly brought to the boiling point, with occasional shaking to complete solution of the haematoxylin, and at this stage 5 cc. of pure carbolic acid, liquefied if necessary, are added."

When cool the solution is ready for use. It is said to keep indefinitely and to possess staining properties equal, if not superior, to those of the solution matured in the usual way.

J. D. T.

Malone (R. H.). **A Fallacy in the Use of Benian's "Relief" Stain associated with the Growth of Micro-Organisms in Two per cent. Aqueous Solution of Congo-Red.**—*Indian Jl. Med. Res.* 1923. Jan. Vol. 10. No. 3. pp. 847–849. [1 ref.]

The author refers to a previous paper in which he described a method of demonstrating the capsule of the pneumococcus by a modification of Benian's relief stain [see this *Bulletin*, Vol. 19, p. 769] in which a 2 per cent. aqueous solution of Congo-red is used ; and he now draws attention to the fact that in this solution certain micro-organisms, one of which is a capsulated cocco-bacillus resembling the pneumococcus, can grow quite readily. To obviate errors from such a source, the Congo-red solution may be autoclaved, have phenol up to 0·5 per cent. added to it, and kept in sterile tubes from which it may be transferred to the slide by means of a sterile platinum loop.

J. D. T.

Emile-Weil (P.) & Isch-Wall (P.). **Présentation d'une seringue à transfusion sanguine.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1922. Nov. 23. Year 38. 3rd Ser. No. 32. pp. 1537–1538.

The description given is that of a simple syringe with a capacity of about 100 cc., fitted with finger pieces, and constructed so that it can be easily manipulated with one hand. It has a lateral canal to which the needle is fitted direct. When in use the weight of the syringe is supported on the recipient's forearm, the needle held firmly with the fingers of the left hand, while the right is left free to manipulate the piston. Having no stopcock, nor attachment of any kind, nor any part where stagnation might occur, the risk of coagulation is reduced to a minimum.

J. D. T.

MATTHEWS (J. C.) & PEARSON (C. V.). **The Lymphoidocyte and the Türk Cell: their Haematological Relationships and Clinical Significance.**—*Lancet.* 1922. Oct. 28. pp. 909–913.

In this article the authors begin by giving, under technique, a description of the "panoptic" stain (Jenner followed by Giemsa) which they used for staining their blood films in differentiating the various cells they refer to. They also compare in tabular form the appearances obtained by the use of Leishman, Jenner, Giemsa, and "panoptic" stains separately. After this they give short definitions embodying what they consider to be the distinguishing characters of the "Lymphocyte," "Mononuclear," "Lymphoidocyte," "Erythroblast," and "Türk cell." In the present confused state of blood cell nomenclature this is necessary to prevent misunderstanding and confusion. A table is also introduced summarizing and bringing into juxtaposition the chief points concerning the "Lymphoidocyte," "Türk cell," "Lymphocyte" and "Erythroblast."

The conclusions they come to regarding the subject matter indicated by the title of the article are :—

"1. That the use of the term lymphoidocyte should be limited to the primordial cell from which all blood cells are developed.

"2. That this cell has clearly defined staining reactions by which it can be distinguished from other cells.

"3. That, contrary to the evidence of Knyvett Gordon, we have failed to find the lymphoidocyte in infective endocarditis or other serious conditions, except disease of the haemopoietic organs in which their occurrence is already well recognized.

"4. That the Türk cell has characteristic haematological features and is found occasionally in normal blood—at most one or two per film.

"5. That its presence in larger numbers is probably pathological and points to the existence of a generalized bacterial infection; and that as regards prognosis its presence has an indirect bearing only."

A "Scheme of Haemopoiesis" tracing the various blood cells from the primordial "Lymphoidocyte" is included in the article.

J. D. T.

HARVEY (W. F.). **Large Scale Production of Vaccine.**—*Trans. 4th Congress Far Eastern Assoc. Trop. Med.* 1921. Vol. 1. pp. 584–592.

In this paper, the author, after referring those interested in the details of production to the work of CUNNINGHAM, BROWN and IYENGAR, published in the *Indian Jl. Med. Res.*, 1917, Vol. 5, No. 1, surveys the problems of large scale preparation of vaccine. This he does under six main headings :—

1. Mode of preparation.—Under this heading, which is further subdivided, he directs attention to some improvements arising out of necessity during the war. Of these the first to be mentioned is the replacement of the special flat-sided culture flask by the ordinary commercial round whiskey bottle, the entire internal surface of which can be covered with nutrient medium after the manner of a roll-culture, giving a unit of glassware as easily handled as the test tube and with an enormous surface for growth. The second is the use of peptone media prepared from raw materials, replacing peptone (a product almost entirely of Germany), which give increased bacterial yield and which are suitable for large scale production. Among raw materials available are ox heart, mutton and casein, together with extract of the pancreas of the pig, sheep or goat. In the preparation

of vaccine for use in Hindu and Mahommedan countries and communities neither ox heart nor pig's trypsin may be used; and in Kasauli casein, which can be cheaply produced and stored in the form of coarse powder, has taken the place of mutton. Attention is also directed to the preparation of an agar powder which presents an already filtered and dried agar. This can be made at any convenient time, can be stored without deterioration, and when required has merely to be weighed out and added to nutrient bouillon to make a solid medium.

The solid medium in use at Kasauli is made by the addition of this powder agar to a tryptic digest of casein. To a 10 per cent. suspension of casein in a slightly alkaline menstruum extract of the pancreas of the sheep or goat is added to 4 per cent., and digestion is allowed to go on for 3½ hours, after which it is stopped and the agar powder is added to 4 per cent. This concentration of agar is necessary to ensure adhesion of the nutrient agar to the inner surface of the culture bottle.

Fluid media have great advantages over solid media in the preparation of large quantities of prophylactic vaccine. Among these are ease of preparation of the medium itself, ease of sterilization, and ease of cleaning of glassware used. The chief disadvantage is due to the peptone. In dealing with organisms which have a natural tendency to sediment and with others where sedimentation is assisted by the inclusion in the medium of a fermentable sugar, the undesired peptone can be got rid of by removing the supernatant bouillon and washing and suspending the sedimented organisms in 0·85 per cent. salt solution.

2. Elimination of Contamination.—The chief difficulty connected with the large scale preparation of vaccine is probably the exclusion of extraneous contamination; and a most important consideration is the primary sterility of the medium on which the vaccine is grown. Pocketing of air in the sterilizer in bottles and other contents will interfere with the sterilizing and must be guarded against. To obtain the necessary pure atmosphere of superheated steam the most satisfactory way is to employ a succession of short period compressions and decompressions to extract all or practically all the contained air in the sterilizer. Next in importance is to see that there is no overcrowding in the sterilizer. The superheated steam used must be proportionately in large volume to the material to be sterilized and must circulate freely through and around that material.

3. Standardization.—Under this heading the author includes tests for purity, sterility and toxicity, as well as the actual determination of strength. Tests for purity and sterility are introduced at all stages in the procedure and for all reagents and media used. Purity test is applied to the contents of the unit receptacle—in this case the bottle—before admixture in bulk. The sterility of the prepared vaccine in bulk is tested in the usual way aerobically in solid and fluid media, anaerobically in a fluid medium. A further sterility test is applied after the vaccine has been filled into capsules—the first and last filled capsules from the flask of vaccine being used for this purpose. As a further safeguard a sample of every capsule of vaccine that is filled is kept. This is possible owing to the type of capsule used. The primary sealing is to close the orifice of the capillary stem; the final results in the cutting off of the capillary stem, but before this is done the capsule is shaken and a portion of its contents cut off in the capillary stem, which is then numbered and kept stored in a slot of corrugated paper.

The standardization of strength is carried out by the turbidity method of Major H. C. Brown, I.M.S. (*Indian Journal of Medical Research*, 1919, July, Vol. 7, No. 1).

The final standardizing test is the tocixity test of the finished product. The procedure is to inoculate 1 cc. of concentrated vaccine before dilution to usable strength, subcutaneously into a guinea-pig. At the same time, therefore, it answers the purpose of an animal test for the dreaded spore-bearing anaerobes which conceivably might have escaped the anaerobic sterility culture test.

The problems referred to under the next three headings, viz., 4, Provision for Emergency, 5, Economy of Labour and Expenditure, and 6, Output, do not call for special notice here, more particularly as some of the most important are incidentally associated with subjects already dealt with.

J. D. T.

von Gutfeld (Fritz). **Ueber die Herstellung, Prüfung und Verwendbarkeit haltbarer Typhus und Choleraimpfstoffe (Trockenimpfstoffe).** [Preparation, Examination and Employment of Stable Dried Typhoid and Cholera Vaccines.]—*Cent. f. Bakt.* 1. Abt. Orig. 1922. Aug. 8. Vol. 88. No. 6. pp. 455–459. [7 refs.]

The author confirms Chiba's work on the use of dry heat in the preparation of vaccines [see this *Bulletin*, Vol. 19, p. 779].

The vaccines referred to in the present paper were prepared by killing the bacteria in a bath at 56° C. (the typhoid bacilli by exposure for 1½ hours, the cholera vibrios for 1 hour), and then drying them thoroughly in a " Faust Heimschen Apparat " at 37° C.

The injection of these vaccines had no unpleasant secondary effects on the persons inoculated.

Accounts of animal experiments which were carried out with (*a*) freshly prepared vaccines, and (*b*) vaccines that had been kept at room temperature for 2½ hours are given.

Summarizing the special properties and extent of usefulness of dry vaccines prepared in this way, the author concludes that (1) they can be easily prepared in bulk and remain free from contamination ; (2) multivalent vaccines can be readily prepared ; (3) they retain their antigenic properties apparently indefinitely without alteration ; (4) they take up little room and are easily transported.

For use a given weight of the dried vaccine is rubbed up and well mixed in the required quantity of 0·5 per cent. carbolized normal saline.

J. D. T.

Harvey (W. F.) & Iyengar (K. R. K.). **The Advantages of Single and Fractional Dosage in Prophylactic Inoculation.**—*Indian Jl. Med. Res.* 1922. Oct. Vol. 10. No. 2. pp. 424–429. [1 ref.]

Experiments with fowl cholera and pigeons in line with similar experiments in previous investigations by the same authors (see this *Bulletin*, Vol. 19, pp. 779–780) are here described and tabulated. A total of 1·5 cc. of prophylactic antigen for each pigeon was given to three groups of pigeons, to group (1) in a single dose, to group (2) in two doses, 0·5 cc. followed by 1 cc. after an interval of 7 days ; to group (3) in three doses of 0·5 cc., each at intervals of 7 days ;

and the immunity conferred was tested by an infecting dose of virulent culture given 12 days (and to some of group (1) 19 days) after the last prophylactic inoculation.

In discussing these experiments the authors say that there is a distinct advantage in dividing up the dose of prophylactic antigen for the production of rapid immunization and that the results of a single large dose suggest a depression of the immunizing mechanism (the production of a "negative phase") by the large dose.

The conclusions they arrive at are :—

"1. Two spaced doses of intravenous prophylactic antigen in pigeons afford better protection than a single dose and three doses better than two.

"2. The production of agglutinins, like the protection afforded, was greater with divided inoculation than with single inoculation of the same total quantity."

J. D. T.

HARVEY (W. F.) & IYENGAR (K. R. K.). **Increase of Dose as a Method of making Use of Old Vaccine.**—*Indian Jl. Med. Res.* 1923. Jan. Vol. 10. No. 3. pp. 739–741. [1 ref.]

In a former communication on the influence of age and of temperature upon the protective power of vaccine, the authors showed that marked deterioration of the vaccine set in after the ninth month of preservation.

They now describe experiments which they carried out to determine if, by increasing the dose, a vaccine which had lost its potency either through the effect of age or of temperature could be used effectively. A table is given "showing the results obtained by prophylactic use, with 2-fold and 3-fold increase of dose, of vaccines which had been kept for 16 months at room temperature and at 37° C., respectively," and the conclusion arrived at is :—

"Under the conditions of the trials made, no evidence is forthcoming that increase of dose will make up for loss, by age or exposure to high temperature, of the potency of a vaccine."

J. D. T.

BOMBAY. **Report of the Bombay Bacteriological Laboratory for the Year 1920.** [HODGSON (E. C.), Officiating Director.]—9 pp.; **and for the Year 1921.** [LISTON (Wm. Glen), Director.]—8 pp. Bombay: Govt. Central Press. [Prices 3 annas & 2½ annas.]

"Simple, rapid and reliable techniques" for the routine Indol and Voges-Proskauer biochemical reactions of lactose-fermenting organisms of the "Typhoid-colon" group are described in the Reports of the Bombay Bacteriological Laboratory for the years 1920 and 1921.

1. The "Cotton-Wool Plug" test for Indol.—This "test is performed in the cotton-wool plug of the culture tube." "In brief" it "consists in moistening the under surface of the cotton-wool plug with a few drops of Bohme's solutions, and heating the culture tube for a few minutes. In the case of a positive result, a rose colour appears on the under surface of the plug. This test may be performed with agar as well as with broth cultures."

2. The procedure described for the Voges-Proskauer reaction is as follows :—

"The culture is inoculated in nutrient broth containing 1 per cent. of glucose; at the end of every 24 hours' period of incubation a loopful

of the culture is removed on a white porcelain slab and mixed with a loopful of a 40 per cent. solution of caustic soda. In the case of a positive Voges-Proskauer reaction a distinct pink colour develops in about five minutes, and if no pink appears in ten minutes the result is taken as negative. In a large majority of positive cultures it was found that 24 hours' incubation suffices, and it was only in a few cases that further incubation was required. In the glucose broth, the pink colour of the V.P. reaction attained its maximum in about 10–15 minutes and faded away almost completely in about one hour. We have shown that if milk be used instead of broth for the glucose medium, not only a brighter pink colouration was obtained, but the mixture of the culture and soda solution solidified on the slab and formed a dry pink spot which retained the intensity of the colour for more than six hours. In certain instances we have observed that when saccharose was used in place of glucose in the culture media, a positive V.P. reaction appeared after a shorter period of incubation, and the pink colour was brighter than in glucose media. A paper on the subject was read at the Medical Section of the 1921 Session of the Indian Science Congress, held at Madras."

J. D. T.

JOURNAL OF LABORATORY AND CLINICAL MEDICINE. 1922. Sept. Vol. 7. No. 12. (i) **A Convenient, Automatic Apparatus for Experiments with Surviving Organisms.** [HANZLIK (P. J.) and DE EDS (F.).] pp. 751–753. With 2 figs. (ii) **A Convenient Form of Test Tube Rack.** [MORSE (Sterne).] pp. 753. With 1 fig. (iii) **Wassermann Test Tube and Pipette Washer.** [SWANBECK (C. E.).] pp. 754–755. With 3 figs. (iv) **Changes in Nutrient Agar due to Clarifying with Egg.** [THOMPSON (L.).] pp. 758–760. With 5 figs. (v) **A Box for Handling Small Animals in the Laboratory.** [KEYSER (D. L.).] pp. 761–762. With 2 figs.

IBID. Oct. Vol. 8. No. 1. (vi) **Preservation of Complement Serum with 25 per cent. Sodium Chloride.** [LYON (M. W.) & TRAGER (V. B.).] pp. 48–50. (vii) **An Automatic Distributing Apparatus.** [CORNWALL (L. H.) & SCHMITT (G. P.).] pp. 56–58. With 3 figs. (viii) **A Continuous Water Still for a Bacteriological Laboratory.** [COOPER (M. L.).] pp. 58–59. With 1 fig.

IBID. Nov. Vol. 8. No. 2. (ix) **A Simple Method to Determine the Coagulation Time of the Blood.** [GOECKEL (H. J.).] pp. 122–123. With 1 fig. (x) **A New Method for Sterilizing Proteins and other Colloidal Compounds without Denaturization.** [MILLS (C. A.).] pp. 134–136.

i. A convenient automatic apparatus for experiments with surviving organs is here described and figured. Certain advantages are claimed for it, the most important of which are that warming of the organ or tissue is rapidly accomplished, that overheating is practically impossible, and that the organ or tissue is not exposed to the atmosphere during washing or removal of solutions.

ii. A convenient form of test tube rack is illustrated. The tubes are supported in open spiral wire holders so that every part of the tube including the bottom can be thoroughly inspected without its being touched.

iii. A Wassermann test tube and pipette washer is described and illustrated. The advantages claimed for the outfit are that the tubes and pipettes can be thoroughly cleaned, with considerable saving of time and that the washing can be safely left to an orderly.

iv. As a result of experiments described it is suggested that :—

" In making a standard agar the method of clarifying should be specified. An agar which is egg-cleared is a special, or egg, agar, because :—

" 1. It contains sulphur compounds derived from the egg.

" 2. The reaction of the agar is influenced.

" 3. A fermentable substance is added, presumably glucose from egg white, which in both anaerobic cultures and on aerobic plates affects the rate of growth of certain bacteria."

v. A box for handling small animals in the laboratory is described and figured.

vi. In laboratories where comparatively few Wassermann tests are done it is probably better to use a preserved complement serum obtained from several animals rather than fresh complement obtained from a single animal. The authors of this publication have used complement serum preserved with 25 per cent. sodium chloride, that is to point of saturation, for over one year and find that it retains its activity for haemolysis with specific amboceptor for from 3–4 weeks if kept on ice, or for about 10 days if kept at room temperature.

vii. This apparatus is designed for use " in laboratories where a large number of serologic, immunologic or chemical tests are routinely performed. Its function is to distribute rapidly a measured amount of any required liquid ingredient to a large number of test tubes or other containers." Under the trade name " Vol-u-meter " it may be obtained from the Will Corporation, Rochester, New York.

viii. This still " utilizes but one source of water for both condensing and distilling ; maintains a constant water level in the flask of boiling water by automatically feeding the flask with hot water as needed to replace the water evaporated ; runs continuously with little attention ; and has a capacity of one litre of distilled water per hour for each flask connected into the system."

ix. No special equipment is required. The usual precautions are observed in obtaining the blood from the finger tip or from the lobe of the ear. Stock slides with ground cavities used for hanging drop examinations are used. One such slide, with two ground cavities, is inverted, and first the centre of one cavity and then the centre of the other is brought into contact with the blood escaping from the puncture, and a good-sized, long-drawn drop of blood is placed in each cavity.

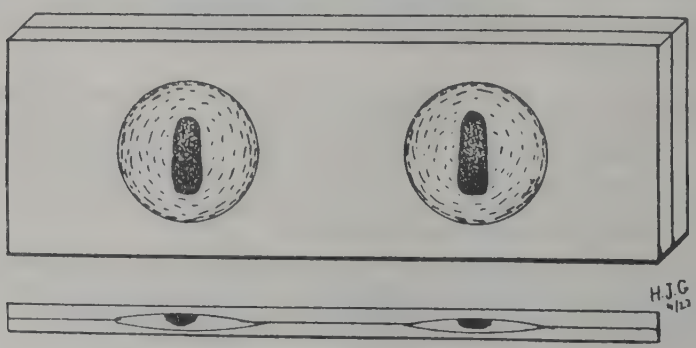


Fig. 1. Method of determining coagulation time of blood [Goeckel].

[Reproduced from the *Journal of Laboratory and Clinical Medicine*.]

The slide is then placed on the top of a second slide lying with the cavities up and paired so that the cavities of the two slides oppose each other and together form small chambers each with a drop of blood suspended on the upper wall of the chamber. When the slides are tilted the non-coagulated blood tends to gather towards the lower border, giving a contrast of a light and dark zone. The accompanying figure shows the slides tilted and also lying flat with the chambers shown in section. The " tilting is repeated about every thirty seconds after the third minute, alternating the incline to cause the blood to flow towards the lighter area." Evaporation is reduced to a minimum and the curved surfaces of the cavity being somewhat magnifying render more visible the distinct clumping of the cells that takes place when coagulation begins. " When coagulation is completed no mobility will be seen, that is all parts of the drop will become fixed or coagulated.

" By this method a coagulation time up to seven minutes appears to be a safe limit."

x. " Summary of results.—Protein solutions may be completely sterilized without alterations in their properties by letting stand the required length of time with the proper concentrating of $HgCl_2$, the precipitate being redissolved and the mercury rendered dialyzable by addition of NaCl. The mercury and salt may then be removed by dialysis, placing copper outside the dialyzing tube to amalgamate with the mercury."

J. D. T.

Poujol (G.). **Notes de technique histologique.**— *Arch. Instituts Pasteur de l'Afrique du Nord.* 1922. Sept. Vol. 2. No. 3. pp. 420–435. With 2 text figs. [4 refs.]

In these notes on histological technique the author directs the attention of the isolated worker to the use of the freezing method for obtaining histological sections. While the paraffin method is specially useful when serial sections are required and while tissues embedded in paraffin may be kept indefinitely and cut at any time, the freezing method is indispensable for rapid diagnosis and has special advantages in conserving fats and fatty acids in sections for later staining by thin elective stains (Sudan red, scarlet red, etc.). Small pieces of tissue fixed in formalin (10–20 per cent. for a few hours will suffice) may be frozen direct from the formalin, cut, stained and examined in a very short time. The freezing method is also the basis of many modern technical methods in the investigation of the nervous system.

In general, all tissues having sufficient cohesion to retain their relations in thin sections are suitable for the freezing method, while very friable, very soft, oedematous, or villous tissues require the paraffin method.

The article finishes with descriptions of special arrangements, attachments or additions to ordinary microtomes to make them suitable for freezing—the simplest, perhaps, being a wooden object-holder to take the place of the ordinary metal one in the Minot or similar microtome.

J. D. T.

i. Harvey (W. F.). **Bacteriological and Laboratory Technique. Section VII.**—*Indian Jl. Med. Res.* 1922. Oct. Vol. 10. No. 2. pp. 361–423.

ii. ——. **Bacteriological and Laboratory Technique. Section VIII.**—*Ibid.* 1923. Jan. Vol. 10. No. 3. pp. 613–664.

i. The seventh instalment deals with "Tissue Preparation," the particular items being numbered from T_2 to T 2·644, and with "Film Preparation," the particular items under this heading being numbered from F_4 to F 4·624.

ii. The eighth instalment deals with "Bacterial Activities," the particular items being numbered from B_1 to B 3·522. An alphabetically arranged index completes each section.

J. D. T.

MISCELLANEOUS.

THEUNISSEN (W. F.). **A Contribution to the Knowledge of the Indian Psychoses.**—*Trans. 4th Congress Far Eastern Assoc. Trop. Med. 1921.* Vol. 2. pp. 78–88.

This is a queer medley of aphorisms and oracular utterances upon the psychology, normal and abnormal, of the natives of Netherlands India.

Living in an easy tropical climate the native has no incentive to work. He has no energy. On the other hand, he is less prone to insanity than Europeans. In his insanity the maniacal tendency predominates. A tendency to depression is seldom seen. There is something simple and infantile about his maniacal states. Delusions and hallucinations and suicide are infrequent. The native is highly emotional. But hysteria is uncommon. His delirium is more frequently the result of fever than emotion. In his dementia praecox the element of dementia is hardly apparent. His conversation is "die and drab"; women and money are his chief topics. Intellectually the average native is inferior to the European. His mind is different from ours.

In discussing these sententious sayings, Dr. TUONBELAKA and Dr. VAN LOON expressed the good old-fashioned opinion that the native mind is very considerably unfathomable by Europeans.

Dr. CILENTO, in speaking of his experience of natives lower in the social scale than the Javanese, stated it as an "unpleasant fact" that although the European has given them security, sanitation, and good food, he has deprived them of all their interests in life, so that in some islands they have sunk into a state of melancholy lethargy, the prelude to total extinction.

A. Alcock.

VAN LOON (F. H.). **Acute verwardheidstoestanden in Nederlandsch Indië.** [Acute Mental Disorders in the Dutch East Indies.]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1922. Vol. 62. No. 5. pp. 658–690.

Among 333 cases of acute mental disorder Van Loon found 176 to be caused by malaria, 76 by syphilis (more in Chinese than in Malays), 10 by pneumonia, 21 by other infections, 29 by dementia praecox, 23 by other predisposing causes (epilepsy, emotions, childbirth, trauma, etc.), and 9 of unknown origin. "Amok," considered by KRAEPELIN to be of epileptic origin, is traced to various different causes. "Amok" is not a clinical entity; the more aggressive attitude of Asiatics in acute mental disorders in comparison with Europeans is caused by the primary psychical condition of the primitive races, readily susceptible to fright and fear, resulting in aggressive defence against the supposed sources of danger. [See also this *Bulletin*, Vol. 19, p. 356.]

W. J. Bais.

Marie (A.). **L'aliénation mentale en Egypte au cours des derniers trente ans.**—*Bull. Acad. Méd.* 1922. Oct. 24. Year 86. Vol. 88. No. 34. pp. 154–157.

The curves and statistics of the Egyptian asylums for the last 30 years show :—

1. Insanity in Egypt is subject to the same seasonal influences as elsewhere ; the maximum of entries is in spring, the minimum in winter.

2. The rarity of alcoholism is compensated by the frequency of hashishism.

3. The extreme frequence of pellagrous insanity is the reflection of the maize dietary of the fellah.

4. The progressive increase of mental troubles, as elsewhere, is decided. The country supplies one insane person to 18,000 inhabitants, the towns one to 2,800.

5. The index of general mortality is 22 per cent. higher than in the asylums of Europe, but less than in the general fellah population.

6. No mental disease of Europe is unrepresented in Egypt.

7. General paralysis is not absent as is often asserted. More than 1,000 cases have been seen in Arabs in the 30 years. The incidence is 0·55 per 10,000, as against 12·3 for Greeks in Egypt, and 25·1 for Austrians. The Egyptian cases are syphilitic in the proportion of 100 per cent.

A. G. B.

Blanchard (M.) & Lefrou (G.). **Deux cas de rage canine observés à Brazzaville** (A. E. F.).—*Ann. Inst. Pasteur.* 1922. Nov. Vol. 36. No. 11. pp. 812–818. [9 refs.]

The existence of rabies in West Africa is well recognized, and now the disease is reported from Equatorial Africa, where, in and near Brazzaville, two rabid dogs have been observed in life and their rabid condition has been established by appropriate experimentation after death. Three natives were bitten in bare flesh by one of the dogs ; there was delay in getting their wounds dressed, but up to three months afterwards none of them had shown any symptoms of rabies. The other dog bit a native in the hand ; the wound was at once treated with iodine and dressed, and the man subjected to antirabic treatment with virus derived from a Parisian source. Of the dogs it is impossible to say whether their infection was indigenous or of imported origin.

A. A.

Hamerton (A. E.). **Rabies in Irak, and its Treatment by Carbolized Vaccine.**—*Jl. Roy. Army Med. Corps.* 1922. Dec. Vol. 39. No. 6. pp. 403–418. [6 refs.]

The fact that in the Mesopotamian Force a dog-bite meant a passport to Kasauli tended rather to put a premium on this sort of accident ; but plenty of cases of hydrophobia occurred.

In 1919, 46 persons were bitten by a rabid jackal in camp ; 28 of the men bitten were sent to Kasauli, but they arrived too late, and 5 died of hydrophobia during or shortly after treatment. Of 18 people not sent to Kasauli, 11 died of hydrophobia. The death-rate among the untreated was 61·1 per cent. ; that among the treated was 17·9 per cent.

In 1920–21, 108 Europeans and 379 Indians were sent to Kasauli ; 3 Europeans and 3 Indians arrived too late and died of hydrophobia.

In 1921, 10 people among the civil population were bitten by a rabid wolf. Two of them—a Sheik (severely bitten in the hand) and his daughter (dangerously bitten in the face)—attended the Baghdad laboratory for treatment, and four months afterwards they were alive and well. The other 8 refused the laboratory treatment and died of hydrophobia, as also 3 donkeys bitten by the same wolf.

The paper also contains general accounts of the diagnosis of canine rabies, of the manufacture of antirabic vaccine, of the indications for and the limitations of antirabic treatment, of methods of treatment, and other pertinent matters.

A. A.

VAN DEN HOVEN VAN GENDEREN (A. J.). **Some Details about the Antirabic Treatment at the Pasteur Institute at Weltevreden.**—*Trans. 4th Congress Far Eastern Assoc. Trop. Med.* 1921. Vol. 1. pp. 501–508.

At Weltevreden a living virus is used for antirabic treatment. It is obtained by emulsifying the brain of a monkey that has been infected from a rabbit. An aseptic and very finished emulsion is made by shaking up the brain—taken hot from the animal—along with a little saline, in a bottle containing glass beads ; it is kept in the ice chest and is not made use of after it is 10 days old. As, for various reasons, native patients are usually more dangerously wounded than Europeans, they receive much more intensive treatment. Cases where symptoms appear 30 days or more after the beginning of treatment are recorded as failures ; and of 1,646 Europeans and 3,291 natives treated between 1913 and 1920, 3 of the former and 69 of the latter have died of the disease. Among these 72 fatal cases, 6 (1 European and 5 natives) showed symptoms 30 days or more after the beginning of treatment. Since 1921 in routine treatment " for the first 10 days we inject, besides the usual daily small dose of living virus, every other day a much larger dose of dead virus " (killed by carbolic acid).

A. A.

DA SILVA (E. Pereira) & FIGUEIRA (Luis). **Le traitement antirabique à l'Institut de Bactériologie Camara Pestana en 1915, 1916, 1917, 1918, 1919 et 1920.**—*Arquivos Inst. Bact. Camara Pest.* Lisbon. 1922. Vol. 5. No. 2. pp. 231–243.

This paper merely contains the following statistics :—

	1915.	1916.	1917.	1918.	1919.	1920.
Number of cases treated ..	2,257	2,517	2,424	2,874	3,879	2,758
Deaths before conclusion of treatment	2	2	—	8	4	6
Deaths more than 15 days after	3	3	2	4	5	4
Mortality per cent.	0·13	0·11	0·08	0·13	0·12	0·14

Persons treated are separated in three classes, namely (1) those bitten by animals verified as rabid either by finding of Negri bodies or by inoculation of rabbit ; (2) those bitten by animals stated to be rabid after veterinary examination ; and (3) those bitten by suspected animals.

A. A.

PHISALIX (M.). **Hérisson et virus rabique.**—*Bull. Soc. Path. Exot.* 1922. Nov. 8. Vol. 15. No. 9. pp. 779–784.

This interesting communication describes in detail the reaction of the hedgehog (*Erinaceus europaeus*) to rabic virus, in four separate experiments, the charge inoculated in each case being 1 cc. of a 10 per cent. dilution of the fixed virus of the Pasteur Institute of Paris. The hedgehog is known to exhibit a considerable resistance to various venoms as well as to certain bacterial toxins, and these experiments confirm those of FRANÇA (*Revista de Med. Veterin.* 1905. No. 40 ; and *Arch. Inst. Roy. de Bact. Camera Pestana.* Lisbon. 1907. Vol. 1. fasc. 2. p. 272), which show that to the virus of rabies also it is very decidedly refractory.

In one experiment on a young female hedgehog of 536 gm. the period of incubation was 84 days, and the animal, after some slight and transient paralysis of the hindlegs and some unusual exhibitions of aggressive behaviour, recovered completely without any check to its growth ; it is still, after 18 months, alive and well.

In the other three experiments—a young female of 480 gm. and two adult males of 905 and 1,000 gm.—the results, after incubation periods of 15–17 days, were fatal in 26, 142, and 65 days, respectively. In these fatal cases the symptoms were paralysis—in one instance initial and terminal, in one instance restricted to the urino-genital tract, and in one instance progressive and including the genito-urinary tract ; tetanic spasms—in one instance general and persistent, and in one instance restricted to the pharynx (in one case not occurring at all) ; and emaciation—in one instance moderate, in one instance great, and in one instance very great and with supervention of cachexia. In none of these cases was there any aggressive behaviour or aversion to water, and only in the cachectic case was food refused. Only in the case that ended fatally in 26 days were the symptoms steadily progressive ; in the other two cases the disease developed with remissions.

FRANÇA, who experimented on hedgehogs with street virus, was able to transmit rabies to rabbits and to other hedgehogs by inoculation with the medulla of hedgehogs dead of the disease ; but in these experiments with fixed virus the medulla of the dead hedgehogs was found to be non-infective for rabbits.

(It is incidentally mentioned that in FRANÇA's experiments with street virus 8 out of 20 hedgehogs infected recovered spontaneously.)

A. A.

GOUZIEN (P.), and others. **L'épidémie d'influenza de 1918–1919 dans les colonies françaises.**—*Ann. de Méd. et de Pharm. Colon.* Paris. 1921. July–Aug.–Sept. ; Oct.–Nov.–Dec. Vol. 19. Nos. 3 & 4 ; and 1922. Jan.–Feb.–Mar.–Apr. Vol. 20. No. 1. pp. 264–303 ; 443–478 and 43–73.

This long paper is a résumé of reports of the great influenza epidemic furnished from the French Colonies. It is calculated that there were not less than half a million victims.

Senegal (THOULON).—Introduced into Dakar by a Brazilian squadron, in 15 days the epidemic disorganized all activities and in 6 weeks had run its course. A Senegalese battalion on the Dakar peninsular was severely attacked and had 690 deaths. In the Brazilian squadron there were 360 cases in 1,380 men. In Dakar itself the death-rate was 6·2 per cent. In Senegal 60 per cent. of the population were attacked, with a mortality of 6·25 per cent. Of 65,000 cases 51,000 were pulmonary. The disease was very severe among natives repatriated from France for tuberculosis.

Mauritania (COMBE).—This country was reached in October. The epidemic spread along the caravan routes and reached the most distant district, Adrar, about 45 days from St. Louis, in March 1919. Communication is scanty. The Moors deal with epidemics by breaking up their encampments into a large number of small groups.

Upper Senegal and Niger (DELRIEU).—Here the cases were estimated at 170,500 with 68,444 deaths, including 25 Europeans. The symptoms are described as chiefly cardio-pulmonary.

Dahomey (BOUFFARD).—Porto Novo was probably infected by canoes from Lagos, with which it is connected by lagoon. The disease was notified from Lagos on September 27 and appeared in Porto Novo on October 7. The most distant district was reached in December. In all 16,000 natives lost their lives.

Cameroon (G. MARTIN).—Duala in the south was invaded in October, Mora and Maroua in the north from Nigeria in December. In the interior the epidemic spread very rapidly owing to the relative density of the population and the wide-spread use of the horse for locomotion. In this Colony, of 399 Europeans 220, or 55·1 per cent., were attacked and 21, or 5·2 per cent., died. Most of the deaths were in old malarial subjects. Of three million inhabitants, a quarter of a million were attacked, with a mortality of about eight per cent. The aged were almost spared. There were numerous recurrences both in natives and Europeans. Quinine is believed to have had a preventive or moderating action.

French Equatorial Africa (HUOT).—The disease reached Brazzaville in November 1918, not by sea as was expected and actually anticipated, but over-land from the Cape by a steamer coming from Upper Belgian Congo to Kinshassa. Two days later infection had crossed to the French sides and rapidly spread over the Colony.

Middle Congo (MARZIN).—The districts most severely attacked were those bordering the Congo and tributary rivers and those traversed by much used roads. Its progress was checked in the sparely populated districts by the natives leaving their villages unoccupied. No statistics could be collected. The pulmonary form was again much the most frequent.

Oubangui-Chari (RICAU).—Introduced into Bangui in November the epidemic rapidly spread and three weeks later had reached Fort Crampel, 700 kilos away. The Upper M'Bomou was not infected till April 1919, by caravans from the Anglo-Egyptian Sudan. The cases for the Colony are estimated at 150,000; the deaths at 27,000. It is noted that the district of M'Poko, where there was famine, had only 24 deaths, that in Ouham-Fafa, where sleeping sickness raged, the mortality was only 8·5 per cent., and that similarly in Upper M'Bomou there were no deaths, but it is said that the villages in these regions are small and far asunder and intercourse somewhat rare. At Bangui the severest attacks were sustained by aged persons and those exhausted by long stays in the Colony. Such recurrences as were noted were mild.

While mild cases did not appear very contagious, it was otherwise with the pneumonic form, which the attendants of the patient never escaped. The author believes that frequent hand-washing was a bar to infection. One village is thought to have been contaminated by eating the corpse of a paddler dead of influenza. Quinine given intravenously is thought to have had favourable action.

Military Territory of Chad (GROSFILLEZ).—The infection followed the caravan routes and its propagation became slow and its course milder as the density of the population diminished.

Gabon (DAVID).—Infection seems to have been introduced either by the doctor who boarded an infected ship and went down with the disease a few hours later, or by the natives who worked in the lighters alongside, and was at once carried up the Ogooue by the local steamer. Later it reached the Colony overland from Cameroon.

Madagascar (CAMAIL).—The escape of Madagascar till April 1919, is attributed to the scarcity of communication with South Africa during the war; one steamer only was running. A steamer from France infected two ports, whence the epidemic spread rapidly. Fort Dauphin at the extreme south, however, was not infected till July, and the port of Tulear on the south-east coast not till August, both overland. Three isolated islands of the Comoro group escaped altogether. The approximate mortality was :—for Europeans 303 or 13·5 per mille, and for natives 86,000 or 26·5 per mille. All ages and all classes were attacked. The mortality was greater in country districts because whole families perished for want of care and even nourishment. Treatment by quinine and fixation abscess are said to have been useful.

Réunion (AUBER).—Infection was introduced by the steamer that contaminated Madagascar, which was repatriating a ship-load of natives of the island from Marseilles. In the town of St. Denis, 28,000 inhabitants, the epidemic was very severe, causing 1,900 deaths or a mortality of 6·7 per cent. in 70 days.

French Somali Coast (COZANET).—The epidemic probably reached Jibouti by ship from Europe or India in September 1918. Aden was infected at almost the same time.

Union of Indo-China.—The pandemic first made its appearance in July 1918 in Tonkin and Cochinchina and spread very rapidly but with a low mortality. In October grave forms appeared in Cochinchina, and afterwards elsewhere in the Union. The spread was erratic, some provinces being missed and not attacked till later. The disease did not die out till April 1919. The known cases numbered 23,900, the deaths 13,300. Details follow for the five constituent Colonies. The second severe wave reached Cochinchina by ship from India, and it is suggested that the Hindu is specially susceptible to the virus because it was noted that Hindus suffered from an intenser form than Annamites.

Martinique and Guadeloupe.—Influenza reached Martinique in July 1908, with a steamer from France. In the garrison of 3,000 it was moderately severe, causing 12·6 per mille of deaths; in the civil population it was quite mild. The deaths for 1918 exceeded those of 1917 by 12 only.

Guiana (LEGER).—Introduced by steamer from Martinique in November. Here too it was mild, and there seem to have been no deaths.

French Establishments in Oceania (ALLARD).—On November 16, 1918, a steamer reached Tahiti (Society Islands) from San Francisco, where influenza was raging. At the usual examination three persons

who were found to be ill were isolated. The next day one succumbed and several of the crew became ill, and shortly the examining doctor, his wife, the pilot and 6 local sailors who helped to moor the ship were stricken. In a fortnight neighbouring islands were affected. The respiratory form with pneumonia and oedema of the lung was most frequent and most fatal. All races were equally attacked, but whereas 51·9 per cent. of natives died, of Asiatics and Europeans only 6·25 and 0·25. Robust adults were chiefly attacked, old men and children little. Forty Tahitian soldiers repatriated from the army of the East, and all more or less malaria infected, were spared, and the author debates whether this should be attributed to the quinine they were taking or the vaccinations for typhoid and cholera to which they had submitted. He says that it was certainly no coincidence. Of 15,300 inhabitants there died 2,498 or 16·3 per cent. and this is not the whole story. At the height of the epidemic at Papeete for want of men to dig graves the bodies were sprinkled with tar and burnt.

New Caledonia (Dhoste).—By good luck and good management this island remained free till July 1921, though communication with infected localities was maintained. The mode of infection was not determined but it spread with great rapidity and subsided as quickly. There were not more than 30 deaths.

A. G. B.

Lister (Spencer). **A Filter-Passing Micro-Organism associated with Epidemic Influenza.**—*S. African Med. Rec.* 1922. Nov. Vol. 20. 7 pp.

The material investigated consisted of the nasopharyngeal washings—obtained in 11 instances within 24 hours of the onset of the disease—from 6 carefully selected cases of influenza at Johannesburg and 9 at Hartebeestpoort. The wash (in warm sterile normal saline) was thoroughly emulsified by shaking in a bottle with glass beads, and passed through filter-candles (Pasteur Chamberlan B, Berkefeld V, and Berkefeld N) under a pressure of 25 lb. The filtrates were cultivated in Smith-Noguchi medium under sterilized vaseline, strict anaerobism being essential. Rigid asepsis was observed in every detail of the preparation of the medium. Special 20 cm. long culture tubes of 1·5 cm. diameter were used. In planting culture tubes about 2 cc. of the filtrate was lodged round the fragment of kidney at the bottom of the tube by means of a teat-and-pipette having the nozzle produced as a long capillary tube. The inoculated tubes (along with controls) were kept in an incubator at 37° C., and samples—withdrawn by capillary pipettes—examined from time to time. After a term of 6–8 days minute bodies, sometimes in enormous numbers, were observed in tubes planted with filtrates from 5 out of the 15 cases.

The bodies are of uniform size, stain deeply with Löffler's alkaline methylene blue, and give a peculiar impression of "hardness"; in a magnification of 1,000 they resemble pin points, and are easily overlooked; they usually occur singly, but may form chains of 3–5. They correspond with the filtrable organisms from influenza patients described by Olitsky and Gates, and are similar to those from a similar source by Gordon.

Preliminary attempts to infect volunteers by spraying nose and throat with the filtrable organism have been made by the author. Of 6 who received the unaltered culture, 1 had a typical attack of

uncomplicated influenza beginning 19 hours afterwards, and 2 had a rise of temperature ; and 4 out of 7 who received filtrate of culture, and 2 out of 6 who received heated culture, had a transient rise of temperature.

A. A.

v. Dijke (M. J.), Bakker (C.) & Hoesen (H. W.). **On the Etiology of Rhinopharyngitis Mutilans.**—*Trans. 4th Congress Far Eastern Assoc. Trop. Med.* 1921. Vol. 2. pp. 129–137. With 16 figs.

Noting that gangosa has become a collective name for all destructive processes of the nasal cavity and face in natives, the authors quote the description of rhinopharyngitis mutilans given by Leys (1906) :— A sore throat, followed by destructive ulceration of the posterior wall of pharynx, posterior pillars of fauces and edge of soft palate. Later the soft palate, hard palate, and nasal septum are destroyed in turn and the nose and mouth form one cavity. In 10 per cent. of cases the cartilage and skin of the nose are destroyed also. Howard found that the ulcerative process may start also at the nose, and Breinl (New Guinea) that it usually begins on the upper lip. Breinl in 7 out of 8 cases found yeast-like parasites, which he named *Cryptococcus mutilans* [this *Bulletin*, Vol. 6, p. 141] ; the authors sought for these without success. Both Breinl and Hallenberger [*loc. cit.*, Vol. 18, p. 257 give illustrations of scars on arms and legs found in cases of rhinopharyngitis mutilans.

The three first cases studied by the authors had a strongly positive Wassermann and reacted quickly to neosalvarsan ; one had suffered from yaws as a child. The authors therefore carefully examined all patients with commencing ulceration in the nose, or showing scars there, for the early stages of rhinopharyngitis mutilans ; enquired of patients with scars on the arms and legs, or elsewhere, whether they had suffered from yaws in youth ; looked for the disease in an area where yaws was endemic ; and examined the nose and throat of all yaws patients.

Eleven cases were collected with destruction of the nasal bone ; in 9 there was a history of yaws ; where the process was active prompt recovery followed administration of neosalvarsan ; in 8 the Wassermann was positive ; 10 showed scars in other regions "intersected by raised streaks," as if caused by burns ; in 4 cases there was periostitis of the tibiae. Many patients were seen with streaky scars, all of whom had suffered from yaws.

In about 130 yaws patients in West Java there were found 3 cases of pronounced rhinopharyngitis mutilans, 8 with ulcerations inside and outside the nose, and 11 cases of yaws nodules in these situations.

It is concluded that rhinopharyngitis mutilans is a tertiary manifestation of yaws.

A. G. B.

Kerr (W. M.). **Should Gangosa be removed from the Nomenclature of Tropical Medicine ?**—*Amer. Jl. Trop. Med.* 1922. July. Vol. 2. No. 4. pp. 353–358. [8 refs.]

The author discusses the relations of gangosa to syphilis and yaws in the Ladrones Islands and elsewhere, passing in review nine papers on the subject. "As far as our present knowledge permits," he writes, "it is fair to assume that tropical ulcerations of unknown

etiology, giving a positive Wassermann reaction and responding readily to salvarsan or its newer derivatives have as an etiological factor either *Treponema pallidum* or *Treponema pertenue*, which are very closely allied organisms." Treponemata have been found in gangosa (Rossiter, Schmitter). The advent of salvarsan "sounded the death knell of gangosa," and the next generation will learn of it only from text books. The author thinks we should cease to employ the term gangosa and place the ulceration thus described in the category of late syphilis or late yaws.

A. G. B.

Jeekssen (J. A. M. J.). **Splenectomy and Splenic Anaemia.**—*Trans. 4th Congress Far Eastern Assoc. Trop. Med.* 1921. Vol. 2. pp. 283–294. With 1 plate & 1 fig.

In Billiton (off the south-east coast of Sumatra) the usual cause of splenic anaemia is malaria, and the author has resorted to splenectomy only in cases where all other lines of treatment have failed to reduce the spleen. He has performed this operation in 16 cases; the age of the patients was between 30 and 35 years, and the average weight of the spleens removed was 1,040 gm. Two of the patients died 10 and 11 days after the operation; five were alive and in good condition a year and a half afterwards; the rest recovered, and as they returned to China on expiration of their contract, were lost to further observation. In the 14 cases that recovered, the average haemoglobin percentage about four months after the operation had risen from 58 to 78, the average number of red cells from 3,760,000 to 4,630,000, the average colour index from 0·73 to 0·84, and the average number of leucocytes from 4,635 to 8,280. The technique of W. J. Mayo, which the author followed in his operations, is described.

A. A.

Leitao (Antonio do Nascimento). **Tellurologie et Climatologie Médicale de Macao.**—*Trans. 4th Congress of the Far Eastern Assoc. Trop. Med.* 1921. Vol. 1. pp. 383–405. With 1 map and 7 text figs.

The climate of Macao (Lat. 22° 11′ N., Long. 113° 33′ E.) is stated to be particularly salubrious throughout the year. The mean annual temperature of 10 years is 71·9° F., the mean summer temperature 82·7° F., and the mean winter temperature 59·1° F. The mean annual rainfall is about 68·9 inches, the average number of rainy days being 148·9. Calm days are rare. Anopheles is not common. *Stegomyia fasciata* and *Mus decumanus* are common, but *Mus musculus* and *Mus rattus* (a variety with a remarkably short tail) are rare. The local rat flea is *X. cheopis*. Plague seldom troubles Macao, and then only in the bubonic form.

A. A.

Embrey (Hartley). **The Investigation of Some Chinese Foods.**—*Trans. 4th Congress Far Eastern Assoc. Trop. Med.* 1921. Vol. 1. pp. 196–210. With 35 charts.

With a view to using local foods intelligently in the new Peking Hospital the authorities at the Medical College are investigating their composition and fuel value. The particulars of 36 of the more common

articles of food are here tabulated, and the results of a series of dietary experiments with white mice are described and graphically recorded. As an item of general interest the author calls attention to the fact that in sprouting beans, apart from the increase in water-soluble C vitamin, there is also decided increase in water-soluble B as well as in the calcium content.

A. A.

KUBO (N.). **Untersuchungen ueber die Hautfarbentöne in Tropenländern (besonders in Formosa).** [The Complexion in the Tropics, especially Formosa.]—*Trans. 4th Congress Far Eastern Assoc. Trop. Med.* 1921. Vol. 2. pp. 257–259.

The muddy discoloration of the skin often seen in natives of the tropics (particularly in Formosa) as well as in sojourners there is here briefly analysed in itself, not in its causation. According to the author the transparency of the skin itself is impaired, the sebaceous and sweat glands are hypertrophied, the squamous epithelial layer is thinned, and the dermal papillae show signs of atrophy.

A. A.

HATA (S.). **Ueber die Salvarsanintoxikation, insbesondere die Dermatitis und den Ikterus.**—*Trans. 4th Congress Far Eastern Assoc. Trop. Med.* 1921. Vol. 2. pp. 169–179. With 2 charts in text.

The various symptoms of arsenical (salvarsan) intoxication are individually discussed at some length—shivers and fever, irritation of the throat, sometimes with swelling of cervical glands, exanthematous eruption on skin and mucosa of gums and throat, jaundice, albuminuria, symptoms of acute enteritis, or, in chronic cases, constipation. The dermatitis, which is urticarial in acute cases, is more eczematous in chronic cases. The jaundice may be the result of acute atrophy of the liver, but usually is catarrhal.

The author during the last few years has administered 4,592 intravenous injections of the Japanese equivalents of salvarsan and neosalvarsan to 864 patients, and has observed 34 cases of intoxication, 24 acute and 10 chronic, 13 severely and 11 slightly acute, 30 manifested by dermatitis alone, and 4 by dermatitis and jaundice together. His treatment is to relieve the liver and clear the bowels with mag. sulph. and to keep the kidneys flushed ; gargles are useful, and the heart may require attention.

A. A.

REVIEWS AND NOTICES.

Ross (Ronald). **Memoirs: with a Full Account of the Great Malaria Problem and its Solution.**—pp. xi + 547. With 11 plates. 1923. London: John Murray, Albemarle Street, W. [Price 24s. net.]

Of factors leading to a just appreciation of Ross's great work on malaria the following seem salient.

A first recollection, his father apparently dying from fever in a scorching Indian plain; at sixteen, equal first in Drawing for all England in the Oxford and Cambridge locals; his wish to become an artist overruled; a medical course begun at Barts, and resolving itself into writing poetry, enthusiastic piano study, and such medical work as would enable him to enter the Indian Medical Service, and thereafter discard medicine for art with the least possible delay; on reaching India, in 1881, a world-course in poetry begun, Italian, French and German being learnt as necessary preliminaries; mathematics enthusiastically and deeply studied; several shorthand systems devised; the violin learnt; plays, poetry and a novel written; and his first leave taken in 1888, worn out, depressed, and feeling, full to the brim as the years had been, that he had nevertheless neglected his duty as a medical man. A return from leave with the D.P.H. and a box of bacterial cultures, the latter useless since he was at once ordered to Burma on the Chin-Lushai Expedition; the opportunity taken to study mosquitoes, resulting in the distinguishing of *Culex* and *Stegomyia* under the terms "grey" and "brindled"; on demobilization his time divided between learning the Greek and Latin languages and reading their verse, writing poetry himself, and searching for LAVERAN's bodies, then known for ten years. These, owing to faulty technique, he did not find, was naturally sceptical of their existence, and in four papers pointed out that bodies which others in India were identifying as such were normal blood constituents. Such are the antecedents which lead to his great work.

Arrived in England, in March 1894, KANTHACK immediately assured him that LAVERAN's discovery was sound, referring him to MANSON, who showed him crescents. Thus began a pregnant, fruitful intercourse.

Although aware of LAVERAN's suggestion that mosquitoes perhaps carry malaria, Ross was immensely impressed by MANSON's conclusions that the swelling and exflagellation of the crescent, occurring only at an interval after extraction, were inferential, not of death struggles, as certain Italians held, but of a phase of life history occurring in the mosquito; and he left for India, after winning the Parkes Memorial Prize on Malaria, determined to test MANSON's hypothesis (which held further that the parasite returned to man through drinking water), after urging MANSON to test it himself. He started work knowing nothing of the zoological classifications, and little of the anatomy, of mosquitoes. In May the lid between Secunderabad and the Inferno wears uncommonly thin, yet Ross drove indefatigably over it at all hours, from hospital to hospital several miles apart, in search of crescent cases; found that he could get mosquitoes to bite by wetting the air; and proved that crescents flagellate far more readily in the stomach of "grey" and "brindled" mosquitoes than in blood from a finger. The mosquito's stomach was, then, the natural locus for exflagellation, and these facts were the first evidence of the correctness of MANSON's hypothesis. But what became of the flagella, which he held to be the next stage. Could they develop into the gregarines found in the pupa and imago? Two and a half months' work showed that this could scarcely be so, since the gregarine life history so discovered was complete in itself. A flagellum was actually watched attempting for a considerable time to enter leucocytes, but the significance of the act was missed. Official duty then made its first and almost complete break in his malarial work, he

being detailed to reduce to reasonable decency the disgusting sanitary state of the Bangalore Municipality, a task into which he threw himself with all his wonted energy, and for which, as the Resident noted, by reason of the zeal, thoroughness and tact displayed, no more capable officer could have been selected. Of this experience Ross wrote,

> We cry " God make us Kings,
> Poets and Prophets here ! "
> The scornful Answer rings
> " First be My Scavenger."

He now swallowed, without ill-effects, large numbers of mosquito gregarines, and on May 27, 1896, wrote to MANSON, " The belief is growing on me that the disease is communicated by the bite of the mosquito. What do you think ? " MANSON dissented on the grounds, erroneous as we now know, that the mosquito bites but once. Incidentally Ross showed, by pricking the finger under vaselin, that exflagellation was not a death spasm, since, under these conditions, the crescent died without exflagellation.

On leaving Bangalore his application, backed by MANSON, and by SIBTHORPE and KING, respectively Surgeon General and Sanitary Commissioner of Madras, to be placed on special duty for the investigation of malaria, was refused ; so he sought, and with difficulty obtained, two months' leave to study it himself. Here he saw, at Sigur Ghat, his first *Anopheles*, though he did not know it by that name till after he had proved his case, and discovered that the number and kind of mosquitoes haunting houses is no indication at all of the general mosquito population of any locality. Extension of leave to study malaria was refused and he was ordered summarily to Secunderabad instead of to the malarious spot he would have chosen. Yet, as he wrote,

> ". . . . where we cannot choose
> The crown of life is set."

He determined that his investigation should now take the form of feeding mosquitoes on malarial blood and searching every part of their bodies for any evidence of parasitism. There occurred repeated failures to infect " grey " and " brindled " mosquitoes with human malaria. Almost on one and the same day he found in his hospital the second *Anopheles* he had ever seen, that is he recognized it as akin to the dapple winged Sigur Ghat insect, and one of his three collectors, paid of course by himself, brought in material from which there also emerged mosquitoes of the same type, probably *A. stephensi*. They were duly fed, and four days later, on August 20, 1895, tired, in great discomfort from the dreadful weather, discouraged because none of the new mosquitoes had so far shown anything which he had not already seen in thousands of " grey " and " brindled " forms already dissected, having examined all the body tissues of yet another and found nothing, he, reluctantly, and as a matter of duty, went over the separated stomach. There before him lay cells, 12μ in diameter, too circular, too sharply outlined and too small to be the familiar stomach cells, and above all pigmented, and with that quality of pigment which the crescents have. Next day, in the last mosquito of that batch, there were the same cells, but larger. Having verified this infection and this growth in three other mosquitoes, controls throughout being free from infection, he reported on September 15 to the Director General—through the usual official channels—" The cells are, in my opinion, probably the long-sought alternative form of the parasite of malaria in the mosquito " and on September 27th he was stunned by receipt—through the usual official channels—of an order to proceed to Bombay. This second complete break in his investigations resolved itself into banishment to a non-malarious locality, terminated four months later, after the active intervention of MANSON and FAYRER, by transfer to Calcutta on special duty for the investigation of malaria and kala azar, with headquarters in Calcutta.

MANSON wrote to him at this time regarding MACCALLUM's observations : " If the polymitus is a fertilising factor in the halteridium cycle the flagellated body of malaria is also a fertilising factor in the plasmodium

cycle. And if this is the case, and the fertilised crescent-derived sphere becomes transmuted into a travelling-cell-piercing vermicule in the stomach of the mosquito we have the explanation of the pigment in your mosquito stomach cells." Since Ross could get no suitable crescent carrier in Calcutta he switched temporarily to the related Proteosoma, satisfied that the same life cycle must hold for both. First was entailed the easy controversion of GRASSI's statement that mosquitoes do not bite birds. Then followed the demonstration that just as in *Plasmodium* do oocysts appear and grow in the stomach of *Anopheles*, so do the oocysts of *Proteosoma* develop and grow in *Culex*, reaching in six days, at the temperature at which Ross worked, their maximum size; and thereafter bursting. Since he had to report on malaria and kala azar in six months, since he could get no suitable malarial cases in Calcutta, and since both malaria and kala azar were to be found in the Darjeeling Terai, Ross, after official permission obtained, moved thither. Neither at Punkabari nor Naxalbari, places which, as a four years' personal experience convinces one, he would, a few weeks later, have found saturated with malaria, could he find suitable malaria cases in man, nor *Proteosoma* infection in sparrows. Moreover, his activities, giving opportunity to a skilfully engineered plague scare, depopulated two tea gardens, and he, perforce, returned to Calcutta with two of his six precious months wasted. Three weeks later he had infected fresh mosquitoes. Then he showed successively, by using a concentrated in place of a weak saline solution for their dissection, that the oocysts contained sporozoïts; that the bursting of the former threw the latter into the coelom; that the latter were broadcasted in the circulation, collected in the thorax more numerously than in the abdomen, appeared in glands, hitherto unknown to Ross, whose ducts he traced to the proboscis and whose function he rightly deemed to be "salivary." The inference was that infection occurred with feeding. The final proof lay in permitting mosquitoes to bite three sparrows proved healthy by several examinations. All became most heavily infected, ten controls remaining without infestation. He wrote to MANSON on 9th July, 1898: "One single experiment with crescents (there are numerous dapple-winged mosquitoes here now) will enable me to bring human malaria into line with Proteosoma. They are sure to be the same. I ought to do it in two months; it has taken me only one to work out the germinal rod cycle." He had won the race against time and accordingly obtained an extension of the period of special duty, but it was not to be devoted to the consummation of the study of malaria which was so thoroughly his due. After a short holiday, forced on him because he had ceased to sleep, he was ordered to Assam to investigate kala azar. Thus occurred the third, the final and irretrievable, interruption to his work, and this consummation fell to Italians. Ross details the evidence which convinces him that they were well acquainted with his work on *Proteosoma*, and writes bitterly of their refusal to acknowledge any indebtedness to him when they demonstrated the life cycle of *Plasmodium*; which attitude of theirs seems to imply that, just as they hold that for *Hymenolepis* the life history varies completely within the genus, so for *Plasmodium* is the life history of the allied *Proteosoma* no guide; and that in reaching it they steered an uncharted ocean. The reader will either give it them both ways or no way, according to his biological knowledge and convictions. For the writer the words, with which the Nobel prize was conferred on Ross in 1902, suffice, "By your discoveries you have revealed the mysteries of malaria."

Such was Ross's great achievement—worked out at his own expense and, except for the final period of special duty, in addition to his official work—attained in the teeth of difficulties, happily, one hopes, incapable of recurrence in India, and which would have smashed a lesser man, or one with less determined supporters.

The mental picture which the perusal of the history of this part of Ross's life leaves on one who has never met him, is that of an inflexible determination driving a versatile and variety-loving ability along its narrow chosen channel.

Clayton Lane.

The Practice of Medicine in the Tropics. Edited by BYAM & ARCHIBALD. Vol. III. Section XI.—Helminthiasis. (pp. 1685–1965.)

In the critique on Section XI of BYAM and ARCHIBALD's Practice of Medicine in the Tropics (this *Bulletin*, vol. 20, p. 521) there are two misstatements. By the incorrect use of inverted commas Professor STEPHENS has been unintentionally unfair in his comment on the figure of *Metagonimus yokogawai*. The specimen is far from " imaginary," carries indeed with it a painfully vivid recollection of seven laborious days spent in making superimposed drawings of remarkably real serial sections, the necessary preliminary to the fluke's reconstruction ; which is after all only another way of saying that it is a necessary preliminary to determining the actual shape and position of the viscera under conditions in which they are not distorted and displaced, as they inevitably are by the usual crushing process.

Again, the figure of *Diphyllobothrium stemmacephalum* is accompanied, not " merely by a scale " as stated, but by a legend, actually inordinately long because its words were not counted, as were those of the strictly rationed text ; in which legend can be read the reason for illustrating the genotype and not man's parasite.

Of the criticism proper there is no complaint, though this opportunity may be taken to point out that, with figures as strictly rationed as words, it did not seem unreasonable to leave deliberately to other publications, including Professor STEPHENS' own standard textbook, the familiar stereotyped figures which he so "longs to see."

Clayton Lane.